For Users of Heath/Zenith Computers

SEXTANT®

Issue No. 28 May-June 1987 $3.50

The Z171: IBM Compatibility, To Go

See page 9.

Photo by Wayne Rash, Jr.

9

Looking for a portable computer with two 5¼" drives? One that will let you use the same floppies as your '138, '148, '150, '241, or '248? And still fit on an airplane tray table? The Z171 may be the answer for you—especially now that it comes with an improved display.

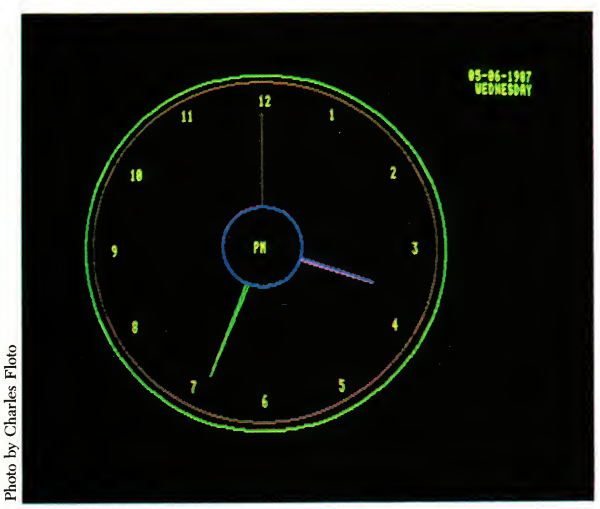

Photo by Charles Floto

64

In the age of digital computers, there are fewer and fewer clocks showing their faces and hands. Here's an alarming addition for your H/Z100.

SEXTANT

Features

Issue #28
May-June 1987

Departments

Cover photo courtesy of Zenith Data Systems

The Editorial Eye

Photo by Charles Floto

Some years, the weather in Washington seems to jump directly from winter to summer. Other years, it jumps back and forth over and over. As a consequence, our famous cherry blossoms don't always last very long. I've learned to grab Spring whenever I get a chance, even at the risk of overdoing things a bit—like the first Saturday in March, when I went out for a walk and just kept going for four hours.

The season of new beginnings came to town a little early this year—in February, in fact. Peggy Wallace started as our new editorial assistant. Beverly Voigt jumped from that position to managing editor. Both Peggy and Beverly have made good beginnings with their new responsibilities.

The changes came about because Elizabeth Saxon-Giles decided to devote full time to studying computer science. Beth had been with *Sextant* off and on since our second issue, Summer 1982. She started as production assistant, and served as production manager, marketing assistant, programmer, and managing editor—among other contributions to the team. Beth had a central role in hiring three of our current employees, and even lured her younger sister into the company. She also left us with the drawing we use to remind you to alert us to your changes of address. (See page 43.)

The Capital Heath Users' Group has started Spring planting in preparation for the Fall harvest of CHUGCON 87. It's set for October 24-25 at the Sheraton Hotel in Tysons Corner, Virginia. I'm glad to see CHUG planning for their conference so early this year.

One reason for the success of the national HUGCON is that planning for "next year" begins before *this year*'s conference is over. (This year it's August 21-23 at the Hyatt Regency O'Hare just outside Chicago.) Well, HUG, you'd better get in gear for next year pretty soon! I hear CHUG has already picked the site of CHUGCON 88.

A year ago, our cover featured the news that the Internal Revenue Service had decided to buy 15,000 to 18,000 Z171 portable computers from Zenith Data Systems. Since then, ZDS has started shipping '171s with the improved display featured on the cover of this issue. Wayne Rash apparently thinks the IRS made a good choice, but he does have a few reservations about the Z171—see page 9. Next issue, we'll feature a look at the smaller Z181.

By then, another significant government contract for portable computers may have been announced. (Announcement was originally set for mid-February.) I'm sure the other bidders made strong attempts to stop Zenith from continuing its domination of government microcomputer contracts. It will be interesting to see who wins this one.

Charles Floto

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Letters

Fractal modifications

We really enjoyed the fractal articles in the July-August 1986 issue, *Sextant* #23 ["BASIC Fractals"] and the January-February 1987 issue, *Sextant* #26, ["Winning Fractals"]. My co-worker thought it might be interesting to see fractals in the round. So we came up with this modification to Ted Miller's program [in issue #26]. [See Listing A.]

We have a monochrome screen, so of course lines 320 through 420 could be changed for color screens. One way to make this program run faster with more spectacular results would be to change line 190 to read:

```
FOR LENGTH = 250 TO 1 STEP -1:
  FOR ANGLE = M1 TO 360
```

This draws the fractal image from the outside in, and could be terminated when it gets close to the center where it really slows down.

Ken Moen
Peter Michalak
Scott AFB, IL

Useful '89 articles

I received the January-February 1987 issue of *Sextant*, [and] am delighted at your continuing support for the H89. (I own two second-hand ones.) As usual, I find Mr. Janowski's regular column, "The Eight-Bit World," full of useful information. William Clarkson's "Four Upgrades for the '89" and William S. Hall's "Writing Hardware-Independent Terminal Emulators for CP/M and MS-DOS" are very practical articles also.

Enclosed please find a personal check for $55.55 for extending my subscription. My congratulations to *Sextant* and all its contributors for a job well done.

Julian S. Loui
Babson College
Framingham, MA

The ZP-150 and ZDS

Wayne Rash's passing comments in "Zenith: Planning for the Future" [in *Sextant* #26, January-February 1987] on the ZP-150 struck me as accurate, but perhaps needing expansion. There is considerable evidence that ZDS had a much better system than they were willing to admit, but dropped it so as not to compete with the admittedly excellent fully compatible systems. I purchased one with full memory recently when ZDS really dropped the price. My reasoning was that for much less than the cost of a true compatible, I could get a terminal with an RS-232-C port, as well as an internal modem, a good subset of GW-BASIC, and a word processor. The other programs looked like a good way to become familiar with that type of software without making a large investment. The lack of a disk system, in light of the large amount of RAM and the ease of moving files between my Z150 and the ZP-150, was not a great concern.

After using the ZP-150 for a few months, I stand by the original decision. However, there are two obvious causes for the ZP-150 to be less of a player than it might have been. The first is a complete lack of support from ZDS for the product. I had an interfacing problem due to marginal voltages from the RS-232-C port, and after spending considerable time on the phone with ZDS's technical consultants, I found that they didn't even have a schematic! Repairs are done by substitution. The software support is comparable. Later, some erratic behavior in the software/hardware, which existed when I received it, became so extreme that I had to take my computer to the local dealer. They gave me a new one, so now the bugs are back to a level I can live with. This dealer, widely recognized as one of the best in the country, also seems totally unfamiliar with the product.

Secondly, ZDS seems to have, at least through neglect, kept the ZP-150 from being even partially IBM-PC compatible. An examination of the files in ROM, and some of the unsupported functions, shows that the ZP-150 is capable of being

```
10 REM  FILENAME FRACTALS
20 CLS: PRINT "Ed Byrnes Fractal Image Maker"
30 PRINT "Enhancements by Ted Miller"
40 PRINT "Enhancements by Ken Moen and Peter Michalak"
50 PRINT "Z-100 VERSION"
60 DEFINT I : DIM IMAGE(122): J$=STRING$(246,32)
70 ON ERROR GOTO 670:FILES"????????.PAR"
80 PRINT "The picture files above are presently on the default drive."
90 PRINT "Load picture file? (Y or N) ";:ZZ=ASC(INPUT$(1)) AND &H5F:PRINT CHR$(ZZ)
100 IF CHR$(ZZ)="Y" OR CHR$(ZZ)="y" THEN GOTO 120
110 IF CHR$(ZZ)="N" OR CHR$(ZZ)="n" THEN GOTO 120 ELSE GOTO 90
120 INPUT "Name of this fractal (do no use . or extension) ";A$:CLS
130 IF ZZ=89 THEN GOSUB 590
140 IF ZY()89 THEN INPUT "LAMBDA & ASPECT RATIO(.5 CIRCLE) ";ACORNER,BCORNER,SIDE
150 IF ZY()89 THEN INPUT "START ROW (1 For New Image) ";M1:CLS
160 IF ZZ=89 THEN GOSUB 440
170   C = .01745329#
180  V=SIDE
190      FOR ANGLE = M1 TO 360: FOR LENGTH = 1 TO 250
200  X=LENGTH * COS(ANGLE*C):Y=LENGTH * SIN(ANGLE*C)
210  AC=X/(ACORNER*100) : BC=Y/(BCORNER*100)
220  X%=X+320:Y%=(Y*V+112)
230 GOSUB 290
240 AZ=0:BZ=0
250 ZZ$=INKEY$:IF ZZ$="Z"  THEN GOTO 690
260 IF SIZE0 =>4 THEN PSET(X%,Y%),R
270 COUNT=0:SIZE0=0
280 NEXT:NEXT: GOTO 690
290 AX=AZ^2-BZ^2+AC:BX=2*AZ*BZ+BC:AZ=AX:BZ=BX:SIZE0=AX^2+BX^2
300 IF SIZE0=>4 THEN GOSUB 320: RETURN
310 COUNT=COUNT+1: IF COUNT(100 THEN 290 ELSE RETURN
320 IF COUNT >99 THEN R=7
330 IF COUNT >50 AND COUNT <=99 THEN R=0
340 IF COUNT >25 AND COUNT <=50 THEN R=7
350 IF COUNT >15 AND COUNT <=25 THEN R=0
360 IF COUNT >8 AND COUNT <=15 THEN R=7
370 IF COUNT >7 AND COUNT <=8 THEN R=0
380 IF COUNT >5 AND COUNT <=7 THEN R=7
390 IF COUNT >3 AND COUNT <=5 THEN R=0
400 IF COUNT >2 AND COUNT <=3 THEN R=7
410 IF COUNT >1 AND COUNT <=2 THEN R=0
420 IF COUNT >0 AND COUNT <=1 THEN R=7
430 RETURN
440 ' bload files
450 OPEN "R",1,A$+".PIC",246: FIELD #1,246 AS I$
460 FOR I = 0 TO 224
470 GET #1
480 FOR J = 0 TO 122 : IMAGE(J)=CVI(MID$(I$,2*J+1,2)) : NEXT
490 PUT(0,I),IMAGE : NEXT : CLOSE
500 RETURN
510 ' bsave files
520 OPEN "R",1,A$+".PIC",246: FIELD #1,246 AS I$
530 FOR I = 0 TO 224
540 GET (0,I)-(639,I),IMAGE
550 FOR J = 0 TO 122 : MID$(J$,2*J+1)=MKI$(IMAGE(J)) : NEXT
560 LSET I$=J$ : PUT #1 : NEXT : CLOSE
570 OPEN "O",1,A$+".PAR": WRITE #1,ACORNER,BCORNER,SIDE,ANGLE
580 RETURN
590 OPEN "I",1,A$+".PAR": INPUT #1,ACORNER,BCORNER,SIDE,M1
600 CLOSE
610 PRINT "LAMBDA=";ACORNER;", ";BCORNER;" ASPECT RATIO=";SIDE;" START ROW=";M1;" -
 OK? (Y or N)";
620 ZY=ASC(INPUT$(1)) AND &H5F
630 PRINT CHR$(ZY):CLS
640 IF CHR$(ZY)="Y" OR CHR$(ZY)="y" THEN GOTO 660
650 IF CHR$(ZY)="N" OR CHR$(ZY)="n" THEN GOTO 660 ELSE GOTO 610
660 RETURN
670 IF ERR=53 THEN PRINT "No picture files found!": RESUME 120
680 PRINT "Error #";ERR;" at ";ERL: END
690 GOSUB 510
700 LOCATE 1,1,1: END
```

Listing A. See "Fractal modifications," above, left.

Send a Letter to *Sextant*

Address your letters to: Editor, Sextant Magazine, 716 E Street S.E., Washington, DC 20003.

Letters will be edited according to style and space requirements. Due to the volume of mail received, we are unable to print or respond to every letter we receive.

at least a limited MS-DOS machine with external disk drive support. Run FORMAT.!60, INSTALL.!80, or MSDOS.!80 from the System Manager to see what I mean. It is unfortunate that the installed base on the ZP-150 is small. Otherwise, we would have the same kind of vendor software and hardware support that exists to remedy the many limitations of the Radio Shack line of laptops. Surely there are enough out there for one knowledgeable supplier of such basic things as the cassette-interface cable, and perhaps even a disk drive with operating system.

Alan P. Biddle
Euless, TX

Thoughts on '89 upgrades

I received the January-February 1987 issue of *Sextant* and was pleasantly surprised to find an article on hardware upgrades for H/Z computers ("Four Upgrades for the '89," by William Clarkson). I found it to be well-written and informative, but there are two items that I feel a need to clarify.

The first item relates to the article's reference to using the CP/M cold-boot autocommand and a SUBMIT file to initialize the C.D.R. Super RAM with certain files.

I am using 63K C.D.R. BIOS 2.91-M. When I do as suggested, SUBMIT creates a $$$.SUB file on the boot disk, executes ARAM, and returns to the CP/M prompt. ARAM sets the RAM disk to A:, and the boot disk to B:; the logged-on disk is still A:. Since the standard CCP will look for $$$.SUB only on A:, CP/M will not find it, will not execute any SUBMIT line past ARAM, and will not erase $$$.SUB from the boot disk. I would be surprised if CP/M did otherwise.

Other than hacking the CCP to look for $$$.SUB on B:, I can think of no way to make the technique work as described. I would be obliged if someone would tell me how this can possibly work on any CP/M machine.

Circle #173 on Reader Service Card

The second item is just a personal opinion, but please bear with me. After all, it is my stamp! The article indicates that the author is selling a disk containing four utilities for $20. I can think of at least two reasons why this is a bad idea.

First, the functions as described are trivial enough to make the disk a poor value, even if it contains the source code, which the article does not make clear. Second, even if other people think that the programs are useful, they could do everything the utilities do for free with standard CP/M utilities, public domain programs, or programs from language manuals and magazines.

I know there are several other companies that charge the ignorant for software that is otherwise free, but that doesn't make it right. And *Sextant* doesn't have to encourage this questionable practice by providing free advertising!

James A. Pilarski
Northglenn, CO

If anyone would like to provide a list of sources of comparable software, we'd be happy to publish it. Please include all information necessary to obtain the programs.

A response from the author:

Dear Mr. Pilarski,

This is in reply to your letter of 5-Jan.-87. I will address the second item of your letter first.

You seem to think that software should be free. Yet I suspect you don't question the fact that a piece of hardware normally costs more than the sum of its component prices, to cover R&D, engineering, and yes, even profit. By your reasoning, books should be free also—the paper costs almost nothing. I suggest you check your premises. That kind of thinking, and the actions that so often "logically" follow from it (software piracy), has driven many good software developers out of the personal computer market, and has prolonged the life of irritants such as high software prices and copy protection.

As for your specific objections to my Comptographics Utilities Disk: if you regard the functions provided on it as "trivial," I suggest you try developing BREAK, SetPrinter, SPEED, and TABS yourself. Even if you are a very good programmer (which I am), I don't think you'll find them trivial if you do them well. I know BREAK, SetPrinter, and TABS are not available as "standard CP/M utilities." If they are available as "public domain programs, or programs from language manuals and magazines," I am certainly not aware of it. My experience is that most public domain programs are worth exactly what you pay for them. I would be amazed if my version of SPEED were available anywhere else, since it is specific to the Speed Mod, and not even available from the Speed Mod vendor.

I will not dignify your comment suggesting that I "charge the ignorant for software that is otherwise free" by referring to it as an insult, since you don't know me and have no idea what my standards are . . . . I doubt that *Sextant* readers are "ignorant," especially about computers and software. My standards for software development are very high, as would hopefully be discerned by a perceptive reader of the article. The products on the disk (and yes, there are some additional ones not mentioned in the article) are of much higher quality than anything I have ever obtained "free."

Finally, I happen to be a strong believer in the free enterprise system (maybe you've figured that out by now). If my disk is a "poor value" at that price, people simply won't buy it. I can respond either by adding products to make it more valuable, lowering the price, or just accepting a marketing failure. (So far, there have been quite a few orders for it, most accompanied by very supportive letters.)

On to your first item: I do nothing other than what is described in the article to initialize the C.D.R. Super RAM 89 with specific files. There seem to be a couple of differences between my configuration and yours: I establish *two* RAM drives with the SWAP option, so my RAM drives wind up being A: and B:, and my three physical drives become C:, D:, and E:. I gather you create a single RAM drive. (I don't know why that should make any difference.) Second, I use the standard CP/M BIOS (modified for the Speed Mod, but that's a separate issue), CONFIGURed for 63K. If your "C.D.R. BIOS 2.91-M" is a different BIOS, that *could* make a difference.

When SD (Sorted Directory) is executed from the PROLOGUE.SUB file (next to last line), it displays a directory of drive A: (the first RAM drive), and $$$.SUB appears as the first file. If I subsequently execute SD (or DIR), $$$.SUB isn't there any more. As pointed out in the article, the only time the process stops after the execution of ARAM is when the RAM drive(s) have been previously initialized (p. 40, "Installing under CP/M," beginning with the fourth paragraph.)

W. K. Clarkson
Comptographics
Palos Verdes Estates, CA

Information and an excuse

As a data processing technician in the Navy, one of my recent assignments was

to put together and present introductory microcomputer courses to personnel on base who were using Zenith Z121 and Z158 computers. While preparing my class material, I found *Sextant* to be an excellent source of information on Zenith hardware and the Z-DOS and MS-DOS operating systems. I often found information in *Sextant* articles that I had been unable to find anywhere else, despite long hours spent reading MS-DOS manuals.

As proud owners of an H151, my husband and I have found many articles of interest to both of us in *Sextant*. My husband especially liked the article on creating fractals in BASIC, and our computer spent a few sleepless nights producing beautiful images. It also gave us the excuse we had been looking for to go out and buy a color monitor! Keep up the good work.

Sharon Lee Winter
Pensacola, FL

Software sunset?

Concerning the letter from Mike Silverstone, and William Adney's article, "The PUP Utilities," both in *Sextant* #27, there appear to be "almost to see" and "missed it completely" viewpoints concerning our favorite MS software. All seem to have forgotten, rushing toward that easy bridge that was going to put us all in "U 'n Ix" land, the ones-and-zeroes Eden of endless compatibility and user friendliness. Software gushed forth to the gates of our favorite hardware vendor, update upon update.

Suddenly, it stopped. Reading between the lines, it looks like there was someone standing in the middle of the bridge with a pATT hand. No matter how it reads, this software sunrise got clouded up and dIBMed considerably. As Silverstone shows, we are now on a dribble-down list of things that have been around for some time.

If you got the catalogue with the "PC line" the week after you put together your '100, like I did, get out the rain barrel and catch all the driblets you can. I'm going to C if I can break through this compatibility barrier, because this Orphan is going to be around for quite a while, at least until the M1 goes back up locally.

David F. Knowlton
Inyokern, CA

SEBHC Journal subscriptions—update

Due to the time lag between mailing and publication of letters in *REMark* and *Sextant*, we have been receiving subscription orders for the *SEBHC Journal* at last year's price of $12.50.

Please note: As of January 1, 1987, the yearly subscription rate for the *Journal* is $15. The per-copy price is still $2.50, and your subscription starts in the current publication month. We *do not* start subscriptions retroactively from #1, as some of you have mistakenly assumed.

If you have sent in a subscription at the old price of $12.50, you will receive only ten months of the *Journal*, as shown on your mailing label. [For example, a label stating] "Johnny Computerist—999.12.87" . . . means Johnny signed up in March 1987, and his ten months' subscription expires in December 1987, not March 1988. Got it?

Any back issues you might like to have can still be purchased at $2.50/copy, starting with #1 to #6. Allow at least six weeks for delivery, as we are now photocopying back issues.

Leonard Geisler
Ann Arbor, MI

SEBHC Journal
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Correction

William M. Adney's article, "The PUP Utilities: Zenith's Useful Tools for the '100, '150, and '200," in *Sextant* #27, March-April 1987, page 35, column 1, shows the command line:

DUMP ufn > MORE

This should be:

DUMP ufn | MORE

The vertical bar is required in this case in order to redirect the output of one program to provide the input to another. (The > sign would be used to redirect output to a file.)

ZRAM-205: RAM Multiplier

The ZRAM-205 package is used to modify a Z-205 memory card so that thirty-six 256K RAM chips (not included) can be installed in place of the existing 64K RAM chips giving 1024K of bank-switched memory in the form of four banks of 256K each. Bank 0 (256K) is selected automatically on power-up and must be used as part of system memory. Included MS-DOS software (with source code) makes the remaining three banks into a 768K RAM disk. The modified Z-205 still uses only one S-100 bus slot and will operate at 8MHz if 150 nanosecond RAM chips are used.

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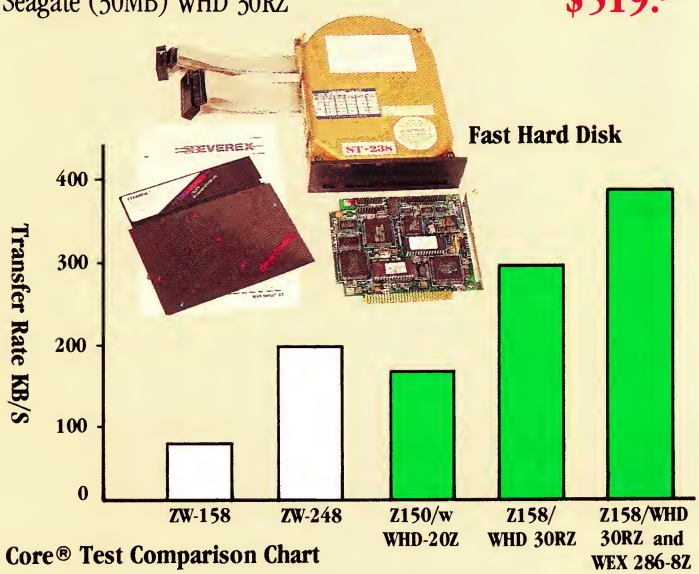

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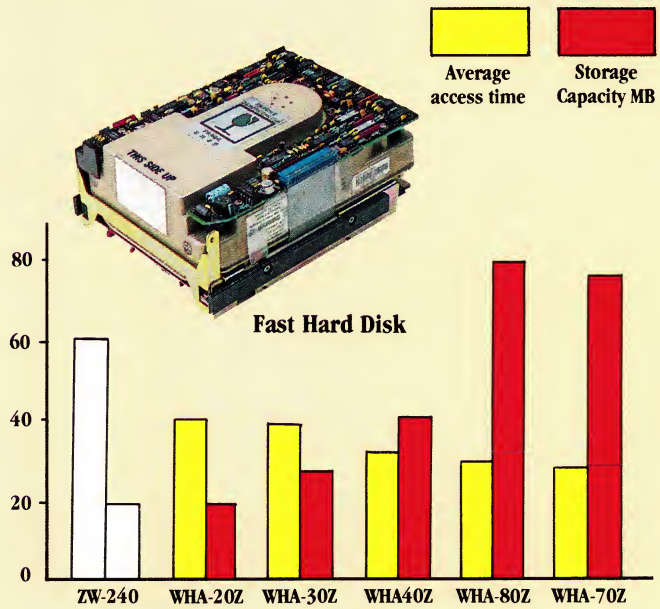

Storage capacity and access time comparison chart

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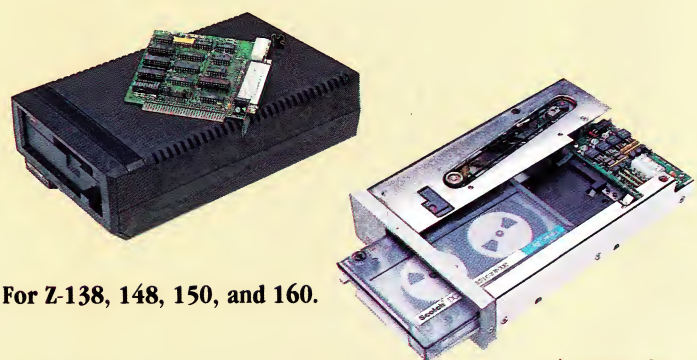

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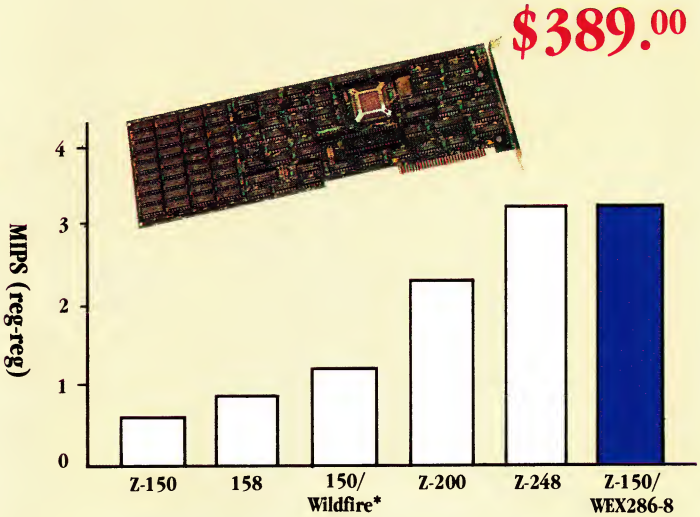

CPU Performance Comparison Chart

★ Software Wizardry

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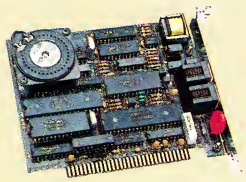

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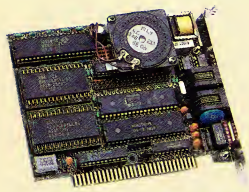

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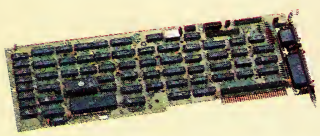

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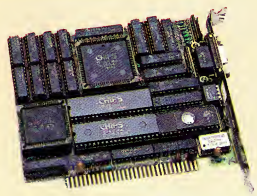

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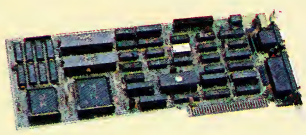

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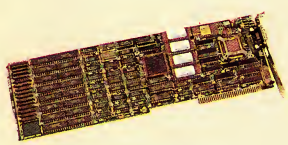

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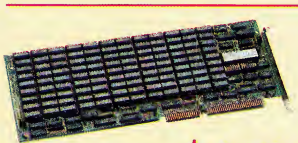

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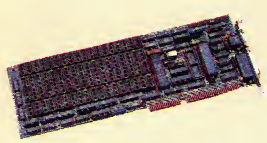

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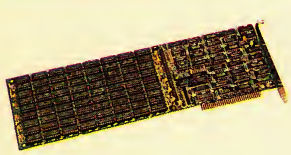

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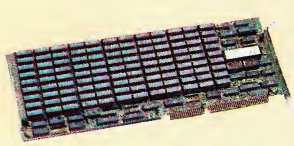

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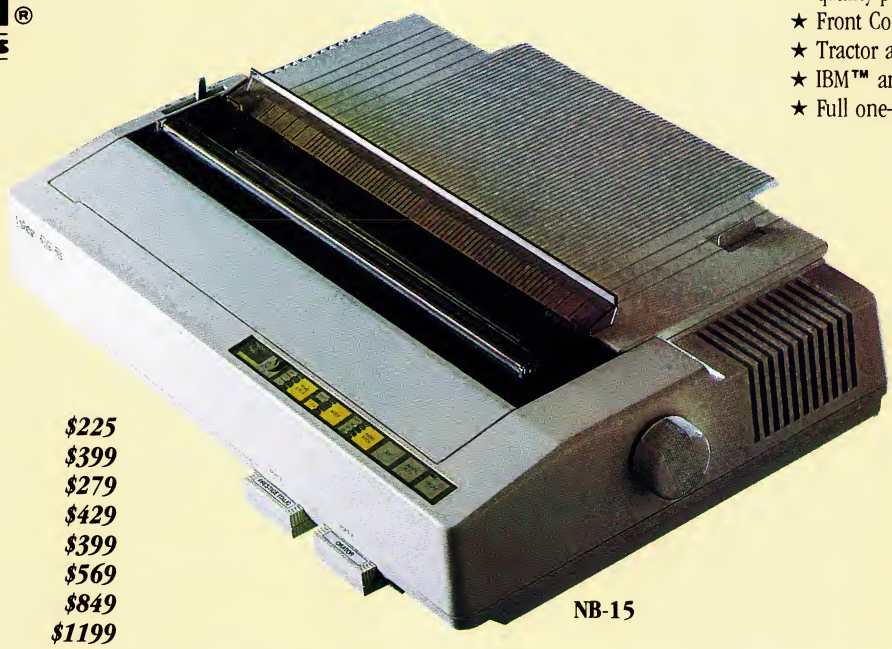

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'150 Compatibility, To Go

Zenith's lightest computer with 5¼" drives now comes with an improved screen.

Wayne Rash, Jr.

The Zenith Z171 is unique among portable computers. It's light enough to be considered a lap-top computer, but its shape is wrong for that. On the other hand, it's much too small and convenient to be considered merely a "transportable" machine. Also contributing to its uniqueness is its use of 5¼" drives instead of the 3½" drives used by other small portable computers.

There is no question, however, that this unique machine is also very usable.

The next time your taxes are audited, you may find out just how usable: the Internal Revenue Service has purchased over 18,000 of these machines for use by its auditors. If my experience with the machine is an indication, most of the auditors should be in a good mood as they sit down to their computers—this is a pleasant machine to use.

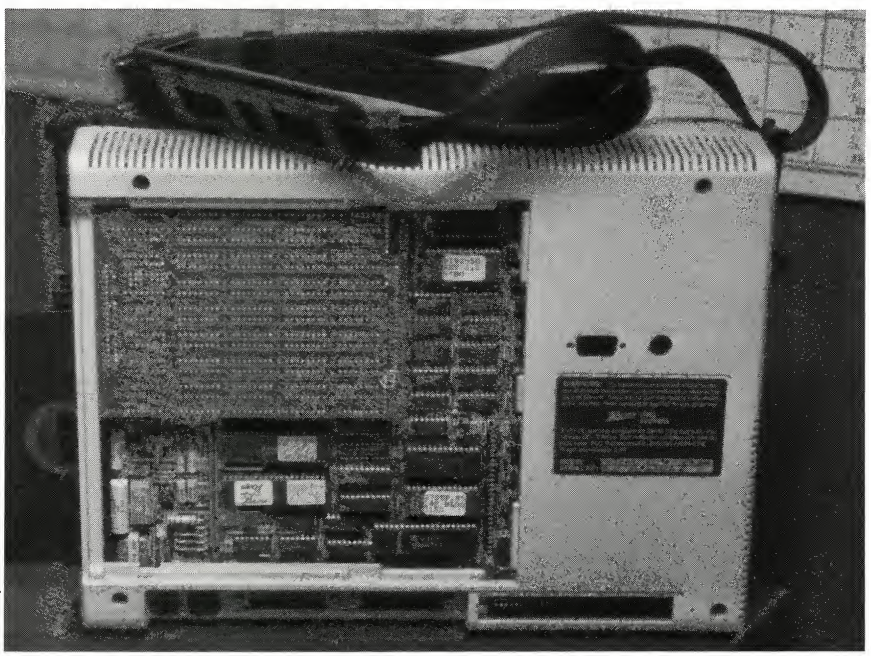

Photo by Charles Floto

Sliding open the rear access hatch of the Z171 provides a peek at its circuit boards. The optional modem plugs in toward the bottom of the access hatch. Below the hatch are telephone connectors and the serial and parallel ports. The expansion bus is to their right. Above the name plate, there are two holes for the connectors of the optional interface for color and monochrome video.

A look at the Z171

This machine looks a lot like a lunch box. Rather than being flat like most lap-top computers, the Z171 sits upright on its base. It's also about the size of a lunch box, 9½" high, 6" deep, and 13" wide. The keyboard folds down to reveal the screen, but is not detachable. The disk drives are on the right side of the machine.

The screen is a back-lit liquid-crystal display (LCD) that's easier to read than were the screens on the early portable computers. The back-lighting also adds to ease of reading in bad lighting.

Newer versions of the Z171 have a screen that features the "twisted-crystal" or "Supertwist" technology that's received so much attention on the '171's sibling, the Z181. The twisted-crystal technology improves the contrast, making an LCD screen considerably easier to read—as shown on the cover of this issue.

With either conventional LCD or twisted-crystal display, the shape of the '171's screen will flatten images slightly, so that pie charts will appear somewhat egg-shaped.

Zenith chose a pair of extremely slim disk drives for this machine. They appear to be about two-thirds the thickness of the half-height drives normally found on portable computers. (They're known as third-height drives.) The doors to these drives are spring-loaded. You need only press against the door to cause it to pop open, ejecting the disk at the same time.

The drives are easy to use because of the spring-loading, but they will sometimes pop open while you're carrying the computer. Since there's no way to lock the drive doors, the only way to avoid this problem is to buy the optional carrying case.

The rear of the Z171 contains a recessed area where the serial and parallel ports are located. There is also a pair of telephone jacks here for use with the optional internal modem.

Near the top of the rear is the location for the optional video plug, in case you wish to use a conventional video monitor. (The review unit did not have the plug.) In this same area, there is a cover for the connector to the expansion bus.

By far the largest feature on the back of the Z171 is the access hatch, a sliding plastic cover that allows access to the interior of the computer. You remove this

Wayne Rash, Jr., is a consultant with American Management Systems in Arlington, Virginia. He has reviewed IBM-PC compatibles for computer publications such as Byte *and* PC World.

cover in order to install the internal modem.

You can remove the entire back of the computer by removing four screws. This will be necessary if you want to add memory-expansion chips. While there is enough room to add a modem board, the area within the Z171 could hardly be called spacious.

The Z171 can be powered either by ordinary AC or by an optional rechargeable battery pack. On the left side of the computer is a recessed area containing the power switch, the plug for the battery recharger/AC adapter, and the knob for adjusting the screen's viewing angle (which effectively adjusts contrast).

Forward of this recessed area is a door that gives access to the rechargeable battery. The battery gave me about three hours of useful activity per charge. You can also use the recharger to operate the computer from an AC outlet.

Using the Z171

The Z171 operates in much the same way as any other computer compatible with the IBM Personal Computer. It runs the Microsoft Disk Operating System (MS-DOS), boots and runs from drive A:, and supports the second floppy drive as B:.

This machine is extremely compatible with the Z150 series of computers and with the IBM PC. In fact, it's much more compatible than the Convertible, IBM's own entry into the lap-top marketplace.

In addition to running as an MS-DOS computer, the Z171 comes with several handy utilities in its read-only memory. These ROM-based programs include a telecommunications program, an appointment calendar, a calculator, and a world clock that includes a map of the world on the screen.

You choose a particular ROM application by pressing one of the special-function keys, which are located on the upper part of the keyboard. These keys are identified by symbols depicting their use (a clock for time, a handset for communications, arithmetic signs for the calculator). Once you choose the symbol you want, you make further choices from menus that appear along the bottom of the screen.

The ROM utilities are fairly useful. The clock utility keeps track of time zones all over the world. It also has an alarm function, and includes the appointment calendar. The communications package in ROM includes an auto-dialer, but unfortunately the program is not able to transfer information to and from disk. The calculator operates in a window, and performs arithmetic functions.

You run MS-DOS by allowing the computer to boot automatically when turned on, or you can tell it to boot by pressing the key that has a disk symbol. You can also enter the ROM utilities directly from MS-DOS by pressing the proper symbol key. By pressing the disk-symbol key when you're finished, you can return to MS-DOS and resume where you left off.

For the most part, the Z171 acts like any other IBM-PC clone, which is exactly what Zenith intended. I found no compatibility problems.

The greatest inconvenience is the LCD screen; it may be better than most others, but it can still be difficult to read if the room lighting isn't right. With the introduction of the "Supertwist" screen, most of those problems should be overcome. In any event, the screen is always a compromise on a portable computer, and the Z171 is no exception. However, in this machine the compromise is acceptable.

Another area of compromise that's characteristic of nearly every small portable computer is the keyboard.

On the Z171, the numeric keypad is superimposed on the keyboard. This is a normal procedure for portable computers because the keyboard would be too wide otherwise. Nevertheless, some software expects a keypad and makes use of it. The superimposition can require you to use the Control and Alt keys to access special keypad features, which is less convenient than a separate keypad.

Travelling with the '171

One of the reasons that you're likely to purchase a portable computer is so that you can take it with you when you travel. To survive, the computer must be rugged

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enough to be bumped around in the trunk of a taxi, carried through airports and their X-ray systems, and tossed into overhead luggage racks or beneath seats on airliners. It's also nice if the machine is flexible enough to be used in your hotel room or on board an airplane.

I tested the Z171 on two trips, and tried it on a parked Boeing 737. (Presidential Airways provided *Sextant* with access to the plane for this review.)

Because of its relatively small footprint, the Z171 will fit the tray tables in Coach, and still leave room to sit and type. Needless to say, there was more than enough room in First Class.

Before you use a Z171 or other computer on an aircraft, you should check with the airline to make sure that they permit you to do so.

The first Z171 I used for this review failed during a trip I took to Montgomery, Alabama, for the Air Force Small Computer Conference. The machine began to erase disks suddenly and without warning.

Despite the concentration of Zenith talent at the conference, the machine remained broken and had to be replaced by Zenith. The second machine provided better service. No explanation has been given as to why the problem occurred.

On both units I used, the cover for the expansion port was also a problem—mostly because it was not well attached, and popped off frequently during travel.

Expanding the Z171

The Z171 comes stock with 256 kilobytes of random-access memory. You can add memory, an internal modem, or a board to drive a video monitor.

All of those additions require access to the interior of the computer. As mentioned earlier, there is an access hatch that will get you started. In fact, going through the hatch is all you need to do in order to install the modem.

If you want to increase the memory to the full 640K supported by MS-DOS, you will need to remove the back of the machine. The '171's memory is installed on a plug-in card attached to the motherboard. You must remove this card, add the extra RAM chips to it, move two jumper blocks to indicate the new amount of memory, and reinstall the card. The process is well covered in the manual that comes with the Z171, and can be performed quickly.

Adding the video card is a little more involved. This is the only accessory that requires connections beyond simply plugging the board into the motherboard. The video card must be attached by screws, and cables must be connected elsewhere on the computer.

And there is one tricky part of the process where you must remove a spacer that's currently installed and replace it with another one. I managed to lose a nut inside the computer when I performed this part of the operation. Once you have

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installed the video card, the connectors for it will protrude from the rear of the computer.

Documentation

The Z171 comes with the owner's manual and the MS-DOS manual, both of which have soft paper covers in plastic spiral binding. Because they're spiral-bound, you can't easily replace pages when you have a change. With a portable computer, the binding change isn't all bad, however. These manuals are much more compact than those of the past, and they're much easier to pack.

The approximately 150-page owner's manual is typical of a Heath/Zenith manual. That is, it's complete, detailed, and easy to follow. Basic operations are covered well enough that it should rarely be necessary to carry the MS-DOS manual.

In addition, you are given complete instructions on installing all options. There is also a complete section on the operations of all the ROM-based utilities.

The MS-DOS manual is the same one distributed with all Heath/Zenith computers. Like the Z171 Owner's Manual, it is complete and easy to use. Zenith has rewritten this manual, and the result is a book that's twice as long as most other manuals for this operating system.

Problems

Unfortunately, the Z171s I reviewed for this article had some problems. There is no way to tell from the sample whether the problems are common to all Z171s, or simply a problem with the individual units. Since I have not heard of large numbers of these problems, however, it's probably safe to assume that they are infrequent.

The most serious problem was mentioned earlier. On the first '171 I used, when any access to the disk was attempted, the computer would erase the disk. This happened even with such basic operations as MS-DOS's TYPE command. One source at Zenith mentioned that this problem had appeared before with the IRS computers, but that it was very infrequent.

On the other hand, the problem with the insecure expansion bus cover seems to happen with nearly every Z171. While this is not debilitating, it will allow contaminants to enter the interior of the computer.

Finally, with both of the machines, the latches that keep the keyboard closed tended to get sticky. One person broke a fingernail while trying to open the Z171.

There's no question—this unique machine is also very usable.

Again, not a serious problem, and not one that happened all the time.

Conclusions

This machine is a departure for Heath/Zenith, in that the basic design for the machine originated outside of the company. The Z171 is derived from the Morrow Pivot. The latter had a 16-line display without back-lighting, and it wasn't very IBM compatible. In order to come up with a machine quickly, Zenith worked with Morrow to bring the machine up to the standards it needed.

The result was a machine that won the first large government contract for portable computers when the IRS agreed to buy 18,000 of them. Other large organizations have also looked favorably upon the Z171. The Ford Motor Company was an early quantity buyer of this machine.

The existence of 5¼" drives in a portable computer coupled with a screen that's relatively easy to read seem to have been the two most important factors in landing these big sales.

Most lap-top computers use the newer 3½" drives. While these drives hold more information than the 5¼" drives, and while the disks themselves are more rugged in the smaller size, there are other factors that must be considered regarding disk size.

If you need to transfer information to an office computer when you return from working on a trip or in the field, there are two ways to do it. You can put the information on a disk, or you can transfer it through a cable. Of the two, the disk is easier and faster. Unfortunately, this option is precluded when you have a machine with the smaller drives, unless you also have a cumbersome external drive system. The use of 5¼" drives avoids this problem.

While the Z171 has been largely eclipsed by the rave reviews for the Z181, this is still a computer worth considering. The new "Supertwist" screen makes the Z171's screen easy to read, and the 5¼" drives make it convenient to use. While it's not the attache-case size of the Z181, it usually is less expensive, and just as capable.

It's rare that one company has two excellent computers in this class. The Z171 is certainly worth having, and if you need the standard 5¼" drive, this is probably your best choice in a portable computer.

Ordering Information

ZF-171-42 Portable Personal Computer, $1,999; ZA-170-1, battery pack, $69; ZA-170-2, padded computer-carrying case, $69; ZA-170-3, internal color video card, $229; ZA-170-4, 300/1200-baud modem, $379; Z-205-4, 256K memory upgrade, $199; TM-170 technical manual, $25.
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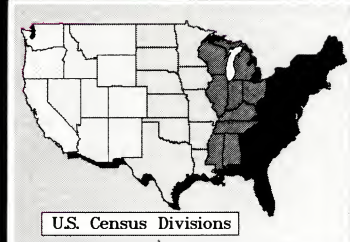

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By Hal Glatzer

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Computer Self-Defense: The First Steps

The care and feeding of your new computer. Grilled-cheese sandwiches are not recommended.

Doris A. Wagner and Alan L. Heigl

So you're the proud new owner of a Heath/Zenith computer system. Congratulations—you've made a wise decision, and therefore have our respect and admiration. Perhaps you already know all you need to know to use your computer well.

In that case, this article may not be for you.

More likely, you may be among the savvy folks who know a good deal when they see one, but perhaps you don't know a whole lot about computers. Or perhaps you're a "computerist" who is moving up to one of the Heath/Zenith machines. Or perhaps you're using the machine of some family member or friend who got you started in computers.

Increasingly, the sophisticated H/Z computers are finding their ways into the homes and businesses (and hearts) of people who need to learn from the very beginning, or from somewhere close to there.

If that's you, then this article is for you.

This is the first installment in a sort of "survival guide." This series is designed to take a quick look at beginners' problems and questions.

One thing we will stress is that there is a wealth of information available in the forms of "paper" and "people." While this article won't touch on particular sources, a major purpose of this series will be to steer you to these resources.

In the meantime, we may be assuming that you know certain things. And we may overlook some questions that you have in mind. In this regard, we can only point out a good rule to follow when reading practically anything about computers, particularly manuals. If you don't understand something, just keep moving along anyway. Something you read much later may clear up the confusion. So also, an answer to your question may pop up when you least expect it. Consider the problem that every writer faces: you can say only one thing at a time. (Any attempt to squeeze in more is either babble or possibly poetry. The written word can be considered a "serial device.")

Since this is a series, readers are free to write to *Sextant* and suggest topics. We have tried to get to the major areas of concern at one point or another, but letters to the editor would allow us to gracefully cover any omissions.

Surviving may require an instinct for what is good practice and what isn't.

In this series, we'll look at various ideas to help you with your computer. There are habits to form and habits to avoid; we'll highlight some of the little problems that annoy even advanced users; and we'll dismiss some myths surrounding computers.

We'll also look at some problems that could be real dilemmas. The gentle art of surviving the early stages may require a good instinct for what is good practice and what isn't, some knowledge about how computers expect their humans to behave, and a candid appreciation that everybody makes mistakes here and there.

We do hope that the more experienced user will browse this series, too. There may be some new facts or insights here, or things you've known but forgotten. You may have some thoughts about areas we've overlooked; in which case, you should write a letter to the editor. (Or you may see something in here that strikes you as pure, unadulterated, misbegotten hooey, in which case you probably *will* write a letter to the editor.)

One minor disclaimer here. Your authors are not paragons of perfection. We don't make backup copies as often as we will be telling you to. Nor are either of us as organized as we'll urge you to be. And so on.

On the other hand, collaborating on this series has made us more aware of our own sloppy habits, and we'll be making some changes and improvements in our own ways of doing things. So we're benefiting from the advice in these articles; we hope that you will, too.

The penny jar

Here's one rule that you can engrave and hang on the wall:

There is no such thing as a finished program—or a complete system.

Whether it's new or used, whatever the model, you have no doubt laid out a significant amount of coin of the realm to purchase your computer. Here's the news, real fast: you aren't done spending, and you never will be.

Don't be shocked or discouraged—just remember that everyone is in the same boat.

The list starts with the hardware itself. You may not have gotten your printer yet. You may be thinking of getting a modem so that your computer can talk on the telephone to other computers and data bases.

Even if you have both of these, you may want to upgrade later.

There's also expansion of your mass storage devices for programs and data. There are various accessories that can go into your computer, and other peripherals to attach to it.

Then there's software. You may have enough of it today. But there are upgrades coming, and new versions, and innovative new programs, too. You'll probably

Doris A. Wagner has used an H89, works with the Z150 and its ubiquitous compatibles, and counts several Z100s as friends. Alan L. Heigl has an H8, H89, H120, and an H160 (also an electric bill that's unreal).

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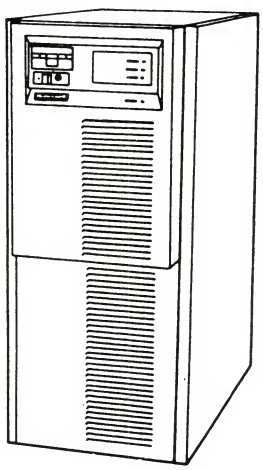

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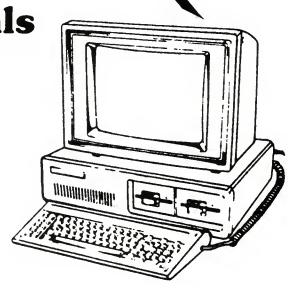

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want some of those. And don't forget books and magazine subscriptions.

Finally, supplies. Blank disks for storage, with labels for the disks; paper and ribbons for the printer; various cleaning products—they're all necessary.

You'll need to start a penny jar.

The environment

Your first step here is to unpack the computer and put it somewhere. (Yes, we know, this is rhetorical—we assume that you weren't just standing around waiting to read this article before proceeding.)

Well, where *do* you put it? Best bet, of course, is in the "computer room." If your home doesn't have one, try to make one, perhaps in an area of the basement or attic. (Two-by-fours, wallboard, nails, etc.—the penny jar, right?)

You don't have to hire a contractor, but the idea is to *isolate* the machine from as much of a potentially hostile environment as possible. If it can't have its own room, then try for a separate corner of a spare bedroom, den or study, or something like that. If you can, keep it out of your normal daily traffic patterns.

You want to keep your machine away from smoke, dust, grease, and other nastiness. Dust covers are *mandatory* when the machine isn't in use—but don't let them or anything else block air vents when the system is running.

Also, keep humidity and temperatures down. Whether it's too hot or too humid, the effect can be the same: altogether unpredictable failures. Programs hang up; files can't be read.

Hardware tends to dislike heat; disks are more affected by humidity changes. They absorb moisture or lose it, and actually change physical shape. However slight the change, it's enough to make the disk potentially unreadable until it gets back to the shape it had when it was formatted.

Doris: My own experience is that anything over 70% humidity tells me I should find something else to do. While a dehumidifier will help, it can also consume power the computer needs in order to compute correctly.

Note that your H/Z hardware manual will list the recommended operating temperature range, and sometimes the humidity range, as well.

Al: It's also worth noting that the H/Z machines tend to be hardier than we mere mortals are. A couple of summers ago, my computer room was constantly at or over a humid 95 degrees. All of the computers were doing just fine, while I was dying. I gave up and bought a small room air conditioner (penny jar), but it was mainly for my own benefit.

> ***Maintain a temperature that's comfortable for you, and the computer will do just fine.***

The best rule of thumb in this area is that if you maintain a temperature and humidity that's most comfortable for *you*, the computer will do just fine.

Keep pets and children a respectable distance from the machine, and supervise the kids' use of the machine. They can do many things with it, but be sure they understand the rules and obey them. (For an upbeat look at the question, see "Kids and Computers: Herbert is My Best Friend," by Frank and Mary Lynn Hutchison, in *Sextant* #8, Winter 1984.)

Doris: There's no need to be paranoid, but a little caution and training help a lot. My disk drives got buttered by a careless child: he plopped a grilled-cheese sandwich down on his game disk and then inserted disk in drive. Machine eventually recovered; game disk did not.

Quiet, please

Electric power for a normal house has variations that may not be suitable for your computer. A quick, but careful, voltmeter check on the outlet is a cheap way to look at your own situation. The classier approach is constant monitoring, and we have a pair of recommendations.

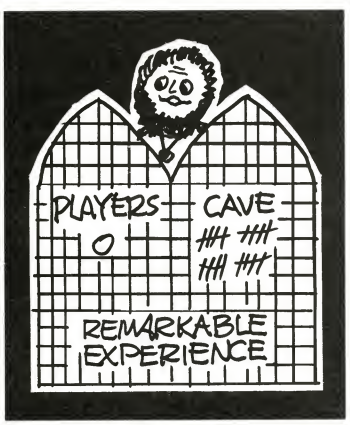
The Heathkit IM-2203 Line Voltage Monitor shows a continuous digital display of the voltage, and also has a "Fault Indicator" light that will alert you to a low-voltage condition. This monitor costs $49.95, and can be mounted on the wall or put on a shelf where it's easily visible.

The alternative is the new Heathkit SK-211 AC Monitor. This little unit uses discrete light-emitting diodes (LEDs) to indicate line voltage to within 5-volt ranges. It also has a fault light. And it adds another light as a "spike indicator"—which will detect momentary "spikes" of over-voltage. List-priced slightly less than the IM-2203, it plugs directly into an outlet; so, you might have to be clever in putting it where it's easily visible.

If your house is *regularly* on the low side, you can use the NORM/LOW switch (on an '8 or '89) to choose that range. Basically, the "normal" setting is for 110 to 130 volts; "low" is for 100 to 120 volts. (The '100 series and beyond are more tolerant of "low" voltage because they use a different type of power supply.)

The problem, though, is not so much that your power may be regularly low as that it may dip now and then, or have spikes of over-voltage. If you have that problem, it might be a good idea to get the SK-211 AC Monitor with the spike indicator, mentioned above.

We have an experience for you!



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While a computer can live without its own private power line, it shouldn't have to share with air conditioners, refrigerators, or other appliances that dim the lights when they are working. Even coffee makers can put a serious if temporary drain on the available power.

Besides inadequate power, your computer also has to beware of electric-line "noise."

Remember, a computer, in principle, knows only 1's and 0's (which are called "bits"). The computer's secret (and its claim to fame) is that it organizes those 1's and 0's in various ways, and manipulates them at rates up to several million per second. We're sometimes amazed that it works as well and long as it does. But a noisy power line can throw in an element of confusion.

There is one easy way to check for some kinds of electric-line noise, and that's by listening to a cheap AM radio near (but not right next to) your computer. Occasional bursts of static on the radio could mean some sort of interference. It might be your neighbor's arc welder, it might be an electric lamp in your home that needs to have some repairs. Try to find out.

Penny-jar time again. There are a couple of ways that you can guard your system against electric-power problems. The first is with a "line filter," which you see advertised a lot. This is usually a multi-outlet box of some kind; many have master on/off switches and a fuse or circuit breaker included. These devices are also called "surge protectors" because they will smooth out many of the power fluctuations. If you are aware of light bulbs flickering, or your TV picture changing size occasionally, your computer is a good candidate for one of these filters.

A filtered multi-outlet box with an on/off switch is an excellent idea in any event. Among other things, it lets you use just one power switch for *all* of your equipment. This guards against the problem of inadvertently leaving on a printer or other peripheral when you turn off your computer.

Heath has recently announced the SK-209 AC Conductor, which both handles surge protection and gives you five-outlet switching. (While you're at it, you might look into the Heathkit SK-201 Telephone and Modem Surge Protector, and the SK-202 Data Line Protector. Spikes and surges can occur on data and telephone lines, too, and these kits provide inexpensive protection.)

The other very serious problem is an interruption of electrical power, and the cure is called an "Uninterruptible Power Supply," or "U.P.S." This unit goes between your wall outlet and your equipment, and contains a storage battery.

Some U.P.S. units will switch over to the battery when the house power fails;

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Circle #175 on Reader Service Card

A DEMONSTRATION OF THE H-89/H-19 SCREEN PRINT PROGRAM

DRAWN AND PRINTED WITH SCREEN PRINT

H-89 PRINT SCREEN

The SCREEN PRINT program makes possible easy printing of any standard H-89 or H-19 text or graphics that can be displayed on the screen. Screens can be saved to a file for later printing or editing. ED-A-SKETCH .PIC files can be displayed on the screen, then edited or printed. Editing features include type RIGHT, LEFT, UP or DOWN in NORMAL, GRAPHICS and REVERSE VIDEO.

The program runs under CPM/80 and is available for EPSON compatable printers, MPI printers and OKIDATA 82A and 83A printers equipped with the Rainbow Technologies Inc. PC-WRITER enhancement module.

The program is $24.95, and is available on H/Z-89 hard sector disks as well as H/Z soft sector double density, single or double sided.

Other available programs are BANNER for $19.95 and the popular CALLIGRAPHY II printer graphics program for $69.00. Both of these programs are available for CP/M or MS-DOS. All programs are sent FIRST CLASS, postpaid.

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SCREEN PRINT FROM SKYCASTLE COMPUTER PRODUCTS

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others are built so that you are always-connected to battery power and the battery is constantly being recharged while the AC power is on. As with filtered power outlets, there are a lot of brands and models of U.P.S. They are all expensive, however. If you don't absolutely need to be "up" constantly, price may be a big factor in your decision whether to buy one.

This whole "power conditioning" area is often the topic of feature articles and reviews in computer magazines, so there's plenty of information available. One other thing—many manufacturers make a U.P.S. that includes its own line filtering, thus doing both jobs in the same cabinet.

The support structure

OK, you have the computer and a good location for it with a proper electrical power source. Now you need something to put the computer *on*. We won't belabor this—you should know that there are a lot of "computer desks" being sold. These can get quite pricey, but are also very nice, especially if you can add an overhead hutch for storage. A plain desk or a sturdy table can serve the purpose, too. The emphasis here is on *sturdy*—your typical "card table" just won't cut it.

Don't forget what they call "ergonomics." There is an optimum relationship between your physical self, the table height, and the height of the chair on which you will be sitting. You do not want physical discomfort to result from those long computing sessions, so "try before you buy" is an excellent idea here.

Another table possibility is the old "horizontal door laid across a couple of two-drawer file cabinets" approach. The advantage here is that you will have some file cabinets. You will want some file cabinets. You will *need* them.

Paperwork

Most people think a personal computer will cut down on paperwork; in practice, it's not true.

In addition to a file cabinet, get some file folders, a nice new ballpoint pen, a felt-tip marking pen, and a lot of lined paper. We recommend a bulk pack of 11" note pads.

Why all this? Because one of the most *crucial* things is to keep track of what you're doing and what you've done.

For starters, label a file folder "Hardware Inventory Details." Then make a list of *exactly* what you've got. Write down what's on the labels on the outside of your machine. Is it an H88? Or a Z90? Write down the "Series No." if the label shows one—that number contains information about when your computer was manufactured.

Then do the same thing with any labels *inside* your computer. There's no need to be obsessed with completeness, but try to make a list of everything that you can. For example, list the visible part numbers of the circuit boards. A raw board for a kit has a number starting with "85-". In addition to that board number, a factory-built board will have a part number starting with "181-". Then look for any IC chips on the boards that have numbered tags on them—these are usually prefixed with "444-". (Don't forget to also write down the socket numbers of these chips—usually a number with a "U" prefix.)

One more thing—the disk drives. Do you have Wangco? Shugart? Mitsubishi? Write it down, along with the model number and even the serial number if you can see the manufacturer's label.

Do this with your peripherals, too—the printer, modem, any other accessories. In short, if there's any way to positively identify something, write it down.

This process applies to your purchased software, too. You can start with the identification numbers found on the distribution disk's label. Beyond that, write down any ID that appears when you start the program, since this may be more specific. (While the disk label may say that it's "MS-DOS 2," the initial screen display will show whether it's version 2.11, 2.13, 2.21, etc.)

All of this may sound like a mighty task, but you have to do it only once. Then, any time you change or upgrade either your hardware or software, you can simply note the changes (and the date) by adding on to your "inventory notes."

Why do we feel that this is so important? Well, for one thing, in the unhappy event that your computer is ever borrowed without permission (all right, stolen!), an extremely detailed list like the one we are recommending will serve as an ironclad means of identification and proof of ownership. (Save all your invoices in a file folder, too.)

Al: While we're on this topic, don't locate your computer where it can be seen from the outside. And one of my very first "computer accessories" was an alarm system. (Doris has one, too.) 'Nuff said?

But the primary reason for your itemized list(s) is that we all need help from time to time. Whether you are presenting your situation to a store employee, friend, users' group, or Heath/Zenith technical consultant, you *must* be able to accurately describe your hardware and software environment.

Al: I distinctly recall one customer at the Heathkit store where I worked who couldn't answer my question as to whether his computer used 5¼" or 8" floppy disks. Until he could help me, *I couldn't help* him. *I really do want to emphasize that people won't get far in computing unless they keep their minds functioning at all times.*

Any other essential paperwork? Well, we'd recommend a file folder that covers

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This ad is a single drawing made with ZDRAFT and some of the fonts which come with it. The drawing was printed on a Tally MT180L and photographed exactly as printed with no paste-up (reduced 2.3:1).

ZDRAFT is $139.00. Demo disk and manual are $25.00, refundable with purchase. Info and samples are free.

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Circle #148 on Reader Service Card

the contents of your floppy disks. You don't normally have to do this "by hand"—virtually all software systems have one or more ways that you can send a list of disk contents to your printer. Don't forget to update these lists from time to time.

Some people have picked up a habit from amateur radio—keeping a "station log" for hardware and software. This is a separate record showing the date and what was done on that date. It could be anything, such as installation of a new accessory, replacement of a broken part, or cleaning the disk drives.

Al: I log in my printer ribbons—it gives me an idea of when I should get a new one, and can also tell me if a particular brand has a longer or shorter average working life.

We'll add just one more item to your computer "environment," and that is some sort of decent *bookcase.* Your hardware and software came with a *lot* of manuals, and you'll be adding more. A visit to a bookstore may be in order from time to time, and those books will need some shelf space, as will any magazines you subscribe to—and perhaps some of those excellent Heathkit educational courses.

The idea is that you will have a massive, growing amount of printed matter that can be very helpful to you. Keep it organized and close at hand.

Doris: I would have to admit to being a disorganized person. I'm a writer, not a programmer. With a floppy collection on the far side of 500, I shudder to think about proper organization now. I archive, using file-compression techniques, things I'm sure I want to keep, and recycle disks carefully. My salvation has been using disks with brightly colored jackets. Gray is a system disk, green is for utilities, red tells my kids to keep their hands off.

That's a brief look at some machine and environmental considerations. Your diskettes are a vital part of your computing activities, also. We'll devote a lot of discussion to them, since many problems are disk-related in one way or another.

The care and non-feeding of floppy disks

There are only *two* proper locations for your floppy disks. When not in use in your machine's disk drive(s), floppies should be in their protective envelopes and stored in a proper container.

In addition, many programs and data should be securely archived. That is, extra copies should be stashed away and used as your ultimate backup. The only time you would use them would be to store new data on them or to copy programs onto new disks from them.

(If these are disks of important data, they're frequently referred to as "master disks." The original program disk you bought from the manufacturer is called the "distribution disk." Either way, they need special protection.)

Al: The first (and only) thing that you should do with a distribution disk is copy it to one or more backup disks and then store it in a safe place. Do not *try to run the programs directly from the distribution disk. The* only *proper function of a distribution disk is as a source for transferring the programs onto your own working disks.*

Reminder—your 5¼" distribution disks should all come with a "write-protect tab" covering the little notch on the side of the disk. If that tab is missing, put one of your own tabs on right away. (You get them with boxes of blank disks.) You do *not* want to do any accidental writing onto a distribution disk.

Regardless of their importance, all disks need to be kept away from heat, moisture, magnetic fields, and static electricity. Keep them stored upright if possible. Don't stack them too high, or squish too many in one box. Keep them away from liquids and smoke. (Yes, that includes cigarette smoke.) *Al: and pizza.*

And don't forget the oil your fingerprints contain. Do not touch the exposed portion of the disk. (And no, you are not supposed to remove the disk from its sealed jacket, although this has occasionally been considered by some beginners.)

Use a felt-tip pen, not a ball point, for your labels. When possible, write on the label first and *then* place the label on the disk.

Beyond this, do some more organizing from day one. If your system is based on floppy-disk drives, you will be much better off if you separate your floppies by function. You may want some disks to be fully bootable and contain one or more programs. Other disks don't need the disk operating system because they will contain just data files.

Further, it's a good idea to have a separate bunch of floppies for each type of computing activity. In other words, keep your spreadsheet data on certain disks, and letters home to Mom on other disks—don't mix them.

Then label the disks properly: "Word Processing Program Disk (bootable)" or "Spreadsheet Data Disk," etc.

And next time. . .

Well, that's about it for this issue. Next time, we'll introduce some general terminology, take a beginning look at operating systems, and make some comments about actually starting to *use* a computer.

Additional Information

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★★★ ZENITH SOFTWARE FOR THE ★★★ Z-100 SERIES COMPUTERS

Zenith packages with software, manuals and registration cards for the original Z-100 computer series (not for the IBM compatibles).

PART NUMBER	DESCRIPTION	LIST PRICE	SALE PRICE
MS-463-1	Z-Basic (16 bit) interpreter	$175.00	$24.00
MS-463-7	Multiplan	$195.00	$24.00
CB-463-11	Z-Chart	$150.00	$15.00
CD-463-2	Condor File Manager	$299.00	$24.00
PK-100-4	All 4 listed above	$819.00	$62.00
MS-253-1	Microsoft BASIC-80 (8-bit)	$175.00	$24.00
OS-53-2	CP/M-85 (8 bit)	$150.00	$24.00
OS-63-4	Z-DOS	$150.00	$35.00
CB-463-9	PECON Peachtree to Condor	$99.00	$15.00
RS-463-1	Peachtree General Ledger	$399.00	$38.00
RS-463-5	Peachtree Inventory Management	$499.00	$38.00
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WI-463-1	Remote Batch Terminal Emulator	$899.00	$28.00
MP-463-7	Wordstar 3.1	$295.00	$65.00
MP-463-8	Mailmerge for 3.1	$135.00	$22.00
CD-463-1	Condor Rel Data Base	$650.00	$145.00
MS-463-5	PASCAL-86	$295.00	$89.00
RS-463-6	Peachtree Sales Invoicing	$299.00	$42.00
PO-463-1	3270 IBM Emulator	$650.00	$68.00

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BP-5063-71	BPI Series Self-Training	$69.00	$25.00
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HCP-837-1	Pearl #3 Program Generator (96 TPI, Requires C-BASIC)	$450.00	$40.00
SC-837-1	SuperCalc	$195.00	$40.00

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All above come with MS-DOS supplied Zenith. Payload charges only $5.00 for shipping of prepaid orders. We can enhance the above computers with more memory or larger winchester drives at low costs to you.

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Winchester Hard Disk Drive External Set-up. Includes Winchester drive, controller/interface card, power supply and case with fan. With 20 MEG (formated) drive $619.00

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UCI MEMORY UPGRADE CARD. We recommend this one highly. The board has sockets for up to 2 MEG of RAM. With no RAM installed $328.00. With RAM installed and fully tested, 512K $387.00, One MEG $446.00, Two MEG $564.00 Add $35.00 for EasyDrive RAM Drive Software if desired.

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Microsoft Word, Version 3

Word has always aimed to provide control of entire documents, not just individual words. The software finally got its act together.

Dale Grundon

The latest issue of Microsoft's Word, version 3.1, represents a program that has been in continual transition. Initially issued in 1984, Word was essentially a word processor that gave some new slants to handling screens, formatting, and editing techniques.

At times, Word has been bundled with the purchase of a Heath/Zenith model '150 system. For the user already familiar with some other word processor, switching to Word would have represented a change only for the sake of trying something new. Switching would have been additionally questionable since not all of Word's potential features were implemented. Attempts to access some of the features listed in the menu (such as spell checking) resulted in the message "Not implemented in Version 1.0." Moreover, Microsoft sold Word on copy-protected disks. (Fortunately, they have now discontinued that practice.)

Version 2 implemented some of the advanced features. (This version was reviewed in *Sextant* #23, July-August 1986. See "Microsoft Word, Version 2," by Freddy Sweet.) However, it was not until Microsoft provided the latest update—version 3.1—that Word really got its total act together.

Word version 3 runs under the Microsoft Disk Operating System (MS-DOS). It is intended for IBM-compatible computers, so it runs on the H/Z150-series and Zenith's other IBM-compatible computers. (It does not run on the Z100 series.) The list price is $450, but I've seen mail-order suppliers offering it for $295. You may want to check around.

Many of the enhancements have transformed this program from a word or text processor to what you might term a "document processor." Using Word version 3, you are no longer limited to just "getting the words right" and determining simple things such as margin widths. Now you can control the appearance of the entire document—type styles, number of columns, etc. With Word, Microsoft has most certainly entered the realm of desktop publishing.

Dale Grundon has been involved in the Heath/Zenith world since the days of the H8. A charter member of CHUG, he manages the Army Teleproduction Center at the Pentagon.

What does it look like?

Word's screen format is "what you see is what you get" (WYSIWYG). If you specify italics, that is what you will see on the screen—not just a symbol or character indicating that you have switched into or out of italics. (See Figure 1.)

Word's greatest asset is its ability to format text to meet today's specialized printing demands.

Three of the bottom four lines on the screen provide information on menu options, and the fourth is used for operating messages and status information. This means that you will have only 19 lines of text displayed. In "Alpha" (text-entry) mode, though, it is possible to turn off the three lines of the menu display—with a result of 22 lines of text. It won't take a new user too long to be able to do without the menu display. Typing the ESCape key—to shift back to the command mode—automatically turns those three lines back on.

How does it work?

Basically, Word is a text processor that has all of the standard features found in most other comprehensive text processing programs.

Word is a menu- and function-key-driven program. You can also program Alt-key combinations to perform certain tasks.

After you invoke Word, you will be presented with a menu, offering such alternatives as going into Alpha mode, getting help, etc. (See Figure 1.) You then move the cursor to a particular choice and hit the Return key. (You can either use the cursor-control keys or a mouse, or type the first letter of the command.) Depending on your choice, Word will execute the command you selected, ask you for something such as a file name, or present you with a more specific menu.

The most obvious benefit of a menu-driven program is that it is easy to learn. To some extent, the program takes you by the hand.

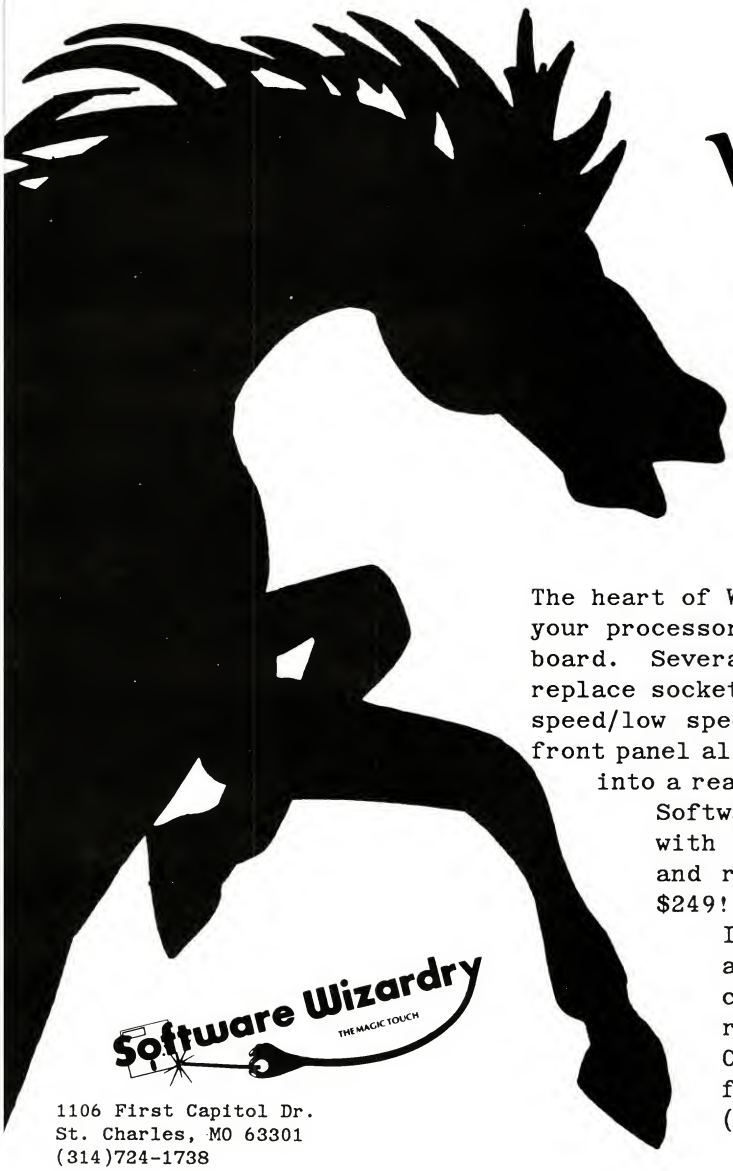
Some of you, however, may be accustomed to "command-driven" word processors (EDIT19 or WatchWord, for example). There, the program doesn't use menus; instead, it accepts commands similar in form to those used at the operating system's command line. If you wanted to read a file, you might type in a command such as READ B:FILENAME.EXT.

The virtue of a command-driven system is that operations can be performed quickly once the user is familar with the program. Those who have become used to command-driven programs frequently object to the need to step through a series of menus. Word's menus, however, are quite well organized.

Also, Word makes effective use of the computer's function keys. After you've used the menu to locate a particular word, for instance, hitting Shift-F4 will find you the next instance of that word.

Moreover, Word makes it easy to set up Alt-key combinations to perform tasks of your own choosing. You might choose Alt-i, for instance, to take you into italics; Alt-b might take you into boldface. It's up to you.

Word can be controlled both from the keyboard and by a mouse system; I have not yet tried it out with a mouse, but the documentation indicates that there is no



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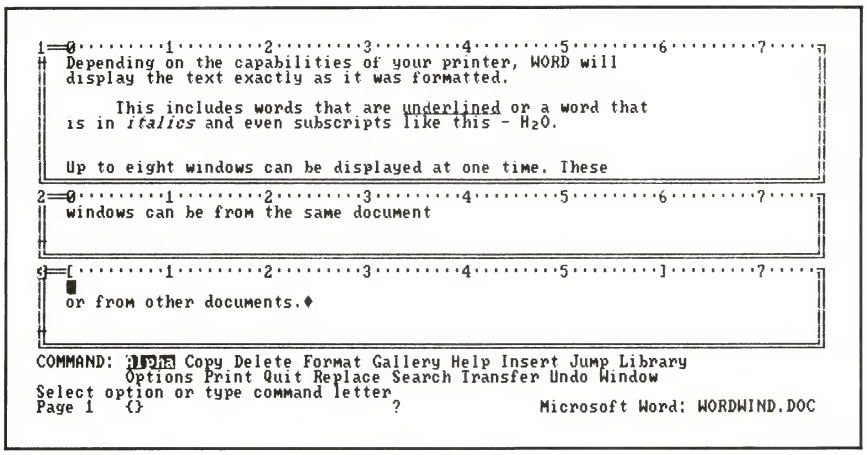

Figure 1. Word displays your text as it will be printed. If you format text to print in italics or some other mode, that's what you'll see on the screen. Word also lets you use up to eight windows of text simultaneously. Near the bottom of the screen are the command options that make up Word's main menu. You can execute a command by moving the cursor to highlight your choice or by typing the first letter of the command. Here, Alpha is highlighted, indicating that Word is in text-entry mode.

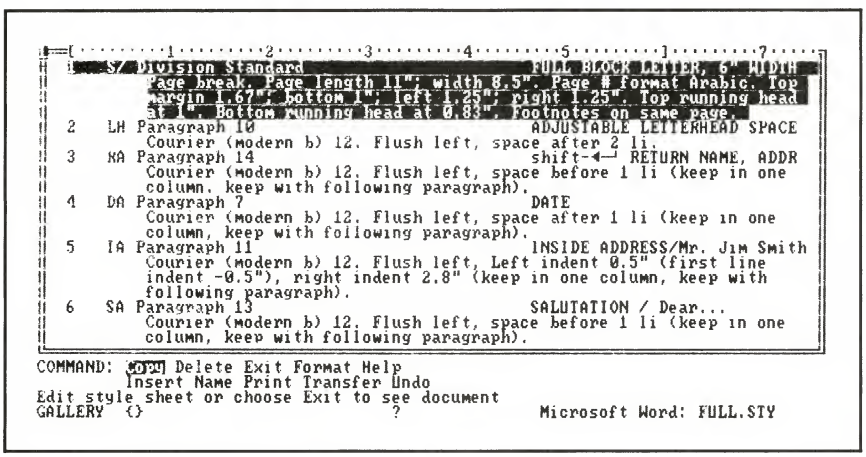

Figure 2. Word's pre-defined style sheet for a standard business letter. You can use Word's existing style sheets, editing them if necessary, or create your own. Choosing the Edit option will step you through the entire process. This style sheet would be invoked by calling for it under the Format menu (one of the choices in the main menu. See bottom of Figure 1.). Doing so would automatically set up a number of Alt keys for particular purposes. For example, Alt-LH would invoke the characteristics of Word's paragraph style number 10.

need to configure the program for just one or the other. You should be able to switch back and forth between them whenever you think it convenient.

Unfortunately, operating a mouse with a word processor requires that you remove your hands from the keyboard. A text-processing function deals mainly with the keyboard, so I feel that using a mouse can only detract from the process. Microsoft has organized the command and operational structure of Word in an outstanding manner, so using the mouse will not substantially increase the speed of the process.

(For more on using Word with a mouse, see "Microsoft Word and Mouse: Do They Click?" by David R. Felstul, in *Sextant* #14, January-February 1985.)

For all its convenience, though, Word does have its own way of doing things. Cut-and-paste editing within Word is quite simple, for instance, but the method of selecting the elements to move within a document is somewhat unusual. You can't just mark some text and move it to a new location in the document. Instead, you mark the material and delete it to "scrap." Then you place the cursor at the new location, and insert the material stored in the scrap.

If this procedure sounds potentially dangerous, you're correct. You'll lose your material if you delete another section of text to scrap before you insert your text at its new location. That will overwrite the text that you were planning to move.

However, one of the features available is "Undo", which cancels the most recent command. In this case, "Undo" will not only restore the second deletion to the text, but it will also restore the first deletion to scrap. The "Undo" feature can help you recover from a number of similarly precarious situations.

What makes Word different?

Word differs from other word processing systems in the particular way it performs standard operations, such as its method of cut and paste, and in its special features. However, practically any word processor could make the claim to unique techniques and a special package of features. Where Word exhibits the most substantial difference is in its ability to format text to meet today's demands for specialized printing.

The fundamental reason for using Word for document preparation and printing would have to be this extensive capability for formatting and printing documents.

The commands to format for italics, boldface, etc., can apply to the whole document, or to any user-selected division: paragraphs, individual words, down to single characters. Unlike some other word processors, Word allows numerous formats on any line or even within any individual word.

Printer support has been vastly expanded in version 3. It now includes drivers for approximately 120 printers, including many of the latest printers that allow downloading or selection of a variety of fonts.

Microsoft supplies a support program that allows you to modify and customize the printer-driver files if you want to go beyond the normal features of most printers. The printer drivers are well documented. (For details on modifying these drivers, you might want to look at *Sextant* #25, November-December 1986. See Ken Daniel's "Patching Word's .PRN Files for More Printer Features.") Additionally, Microsoft has a bulletin board on CompuServe; you'll usually find updated printer-support information there.

How about a little style?

You could do formatting by using the menu or by using the function or Alt keys to enter commands. However, to help you improve the speed of preparation, and to let you retain uniformity from one document to the next, Word provides a "style-sheet" feature. The style-sheet concept provides a method to store and recall formatting for a variety of standard page or document formats.

Consider a business letter. It follows a certain "style": first comes the date, then the recipient's address, the salutation, the body of the letter, and then a signature block. Each of these is placed at a particular location on the paper with the same layout each time a letter is

prepared. You can create your own business-letter style sheet, or use the predefined one that comes with Word. Then Word allows you to attach the style sheet to a document, and that style sheet will then control how Word acts within that document.

In the style sheet, for example, you could establish that the Alt-key code "b" would be used to invoke boldface type; with that style sheet attached to a document, hitting Alt-b would automatically start into boldface. Alt-space-bar will return you to normal text.

Attaching the same style sheet to each letter ensures that they all will follow the same format; and it saves the typist from having to set up the formatting codes every time a new letter is prepared. (See Figure 2 for a sample style sheet.)

Word comes with a business-letter style sheet, a less formal style for your personal letters, and one for outlines. You could use or modify any of these to suit your taste, as well as produce other style sheets for document formats that you often repeat.

Other special features

Some of the other special features included with Word are a "glossary," windows, and a spelling checker. You also get the ability to produce footnotes, indexes, and tables.

When you are producing documents on a daily basis, there are going to be stock paragraphs, long names, phrases, or even addresses that you have to keep repeating. In Word, you can use the glossary to store and recall this type of information. It is essentially a supplementary place to hold something that you may want to save for future use. That space can be in memory, and you can also store the data in a disk file. Word comes with a standard glossary file (NORMAL.GLY), and you can set up special .GLY text files of your own.

A good example of using the glossary would be in handling chemical or mathematical formulas that involve symbols, subscripting, or other unusual formatting. For instance, you might want to insert the chemical formula for water (H_2O). Word allows you to set up a particular glossary (named "chemical," say); then you can include a segment ("water") in that file. Calling this would save you the effort of having to go through the special formatting necessary to produce the subscripted number each time.

While you are working on a document, Word offers you the provision of splitting the display screen into windows. (See Figure 1.) Contained within a window may be a portion of the document you are currently producing or a document from a completely different file. Windowing lets you look at external information; if you want, you can select all of it or just a segment, and then move it into your current document. It can also be used when rearranging the current document. You can open as many as eight individual windows within Word; however, in most circumstances, two windows are quite sufficient.

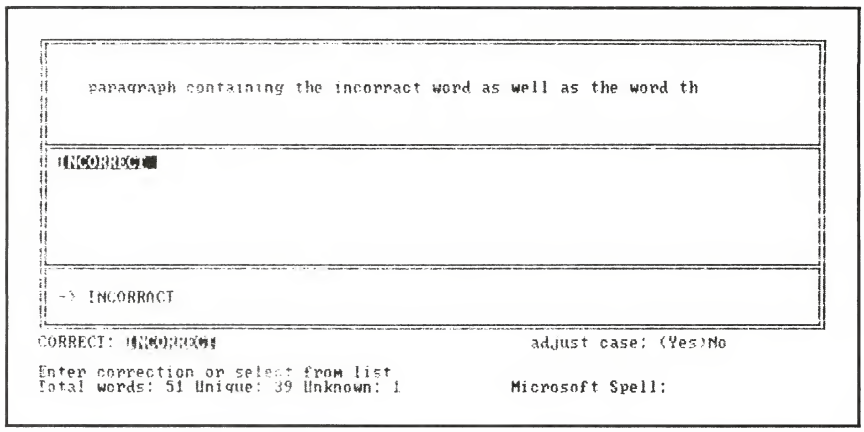

Figure 3. When Word's spelling checker finds an unknown word, it displays a portion of the text containing that word, and suggests some corrections.

Spell checking with Word is quite extensive, and can be accessed from within Word. The speed is comparable to that of a number of other word processing systems. You can have Word check the entire document and mark unknown words, or it can be interactive and show you each unknown word and see if you wish to change it.

You can also select two options for the method that Word will use to check the spelling of individual words: complete words can be checked, or you can tell Word to assume that the first two letters of any word that is to be checked are correct. The latter method speeds the entire process.

When Word discovers a misspelled word, it will display the portion of the sentence containing the word and a list of potential corrections. (See Figure 3.) Words that may not be contained within Word's main dictionary can easily be added; also, you can set up a dictionary unique to a user. Words can also be saved in a special dictionary that is attached to the document being processed. Should that document be rechecked after further additions or edits, the words added will become correctly spelled words.

The main dictionary is provided on a separate disk and is 212 kilobytes in size. This means that running Word from 5¼" disks becomes a disk-swapping venture. Like many other major programs, Word is best suited to a system with a hard disk.

Footnotes, document indexes, and tables of contents are simple to execute. For instance, as you type, you can flag words as index items, table of contents items, or the location of a footnote.

Updating of an index, etc., is essentially automatic. Delete a footnote, for instance, and all of those numbered beyond the deleted one are immediately renumbered. Add or remove an index category,

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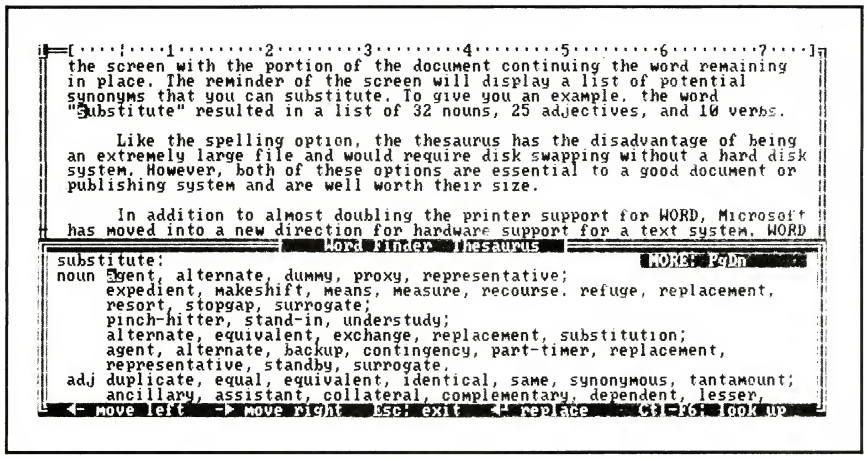

Figure 4. Word's screen display during a thesaurus search. Word shows a portion of the text containing the word at the current cursor position, and offers synonyms.

and you can command an update that will account for the change, producing a revised index.

Helping you write better

One of the prime enhancements in this latest issue of Word is the addition of a 220,000-word thesaurus. This feature helps you find the best word to say what you really mean.

Calling the thesaurus splits the screen; the top section will show the portion of the document containing the word at the current cursor position; the remainder of the screen will display a list of potential synonyms that you can substitute. To give you an example, the word "substitute" resulted in a long list of synonymous nouns, adjectives, and verbs. (See Figure 4.)

Like the spelling option, the thesaurus has the disadvantage of being an extremely large file (around 325K); without a hard disk, it would require disk swapping. However, since both of these options are essential to a good publishing or document-processing system, they are well worth their size.

Other additions and enhancements

In addition to almost doubling the printer support for Word, Microsoft has moved in a new direction for hardware support for a text-processing system. Word now provides drivers for both extended-graphics cards and monitors (as well as for systems that have such extended graphics capabilities already built-in).

As mentioned above, Word displays your text just as it will be printed. This includes characters that are underlined, in bold, strikeover, or in italics. This new software capability is very beneficial when used with such hardware.

Word is also able to perform mathematical calculations on columns of numeric values. Math support includes addition, subtraction, multiplication, and division. Word will sort columns numerically as well as alphabetically, in either ascending or descending order.

Paragraphs can now be printed side by side to produce multiple columns of text. This feature is supported by special methods to allow space for adding illustrations, diagrams, or tables. However, documents that are intended to produce multiple-column printing are not displayed on the screen as they will appear when printed. You must prepare the text in the normal fashion and initiate the repagination process just before sending it to the printer.

Outlines are easy

An outline can be an excellent aid for preparing and organizing your thoughts before you begin to produce a document; it can also serve as notes when you must conduct a presentation before a group. The outline capability supplied within Word is both powerful and flexible. And like many of Word's other special features, it is well automated. In effect, it's a special style sheet: for instance, the cursor will automatically move to an indent position after you finish typing the heading.

The outline feature is adequately supported by the software so that you can devote your main effort to entry of your thoughts. The primary feature that frees you to do the thinking is that Word will take care of the outline's numbering process. All that's required on your part is to enter the related text at the correct location or indentation in the outline. When you're ready, enter the command, and Word will number the entire outline.

Editing the outline is equally easy. If a heading needs to be moved before or beyond its current position or order, the only requirement on your part is to use Word's scrap-and-insert process to place the heading at the new location in the outline. Again, Word will take care of the renumbering process for you. And when you move the heading, Word will automatically move with it any subheadings or associated text.

Another aid in the outlining process is Word's ability to isolate any text from the outline headings. Text can be switched out of the display so that your display principally consists of the outline, making it easier to direct your thoughts toward the next heading or toward new text that you may want to enter. And again, should you have to relocate a heading that's followed by text, simply moving the heading will also move the associated text.

Learning to use Word

As you can see by now, Word is an extensive system. So, learning to use Word could be quite a process for an experienced user, let alone for a beginner. However, Microsoft provides their usual high-quality documentation—both to support the learning process and to help you review any technique that you may not have used for some time after your initial training.

The manuals are well organized and follow a logical sequence. Two main manuals are provided; one serves as a reference for routine operations, and the other gives you good detail on performing any particular function. The manuals fully document special situations—such as advanced setup information, document exchange with other word processing programs, operating messages; and use of the additional supporting programs provided—such as the speller, thesaurus, and word-count and word-frequency programs.

Learning to use Word from the manuals would be possible; but it might be very time-consuming if this is your first experience with a word processing program. It's more convenient to use Word's on-disk training program. The LEARN training program is divided into three main areas: an introduction to the capabilities of Word; basic operating information; and a guide to more advanced skills. Each segment includes guided practice sessions; within a lesson, you can actually perform each of the tasks associated with that lesson.

When you are using Word itself, an extensive help facility can be accessed through one of the main-menu commands. This help facility is available at several levels. There is basic information on-line that can be displayed, or you can actually access the LEARN program.

When you access the LEARN program from within Word, you can either enter the training-segment menu or select the area of information from an index of the subjects. When using this access to LEARN from Word, one point to keep in mind is that the Word and LEARN programs together will take up 256K of available memory. Should there not be

that much memory available, a message to that effect will be displayed and you'll be returned directly to Word. Unfortunately, the message flashes by so quickly that you may not realize that lack of available memory is the reason you didn't get into the LEARN index or menu.

Incidentally, there are two versions of the LEARN program supplied. One is for keyboard operation, and the other is for using a mouse for the editing and selection processes.

Some possible improvements

Compared to the initial version of Word, version 3.1 is a more than sufficient method of text and document processing. However, there are some techniques that are not handled very well or whose improvement could further enhance Word's capabilities.

As has been commented on elsewhere, when you're preparing a long document with Word, it's difficult to be totally sure of where you are without performing the pagination process. Even after pagination, the information displayed on the screen tells you only the page number where the cursor is located. You can never be exactly sure of the position on the page or of the actual number of lines contained on the page. The addition of more page and line-number information would be an excellent aid to the user.

To have the formatting power it does, though, Word needs to keep very good track of where everything is. Incorporating that capability into all its operations might either slow down the program too much, or increase its memory requirements unacceptably.

Another item that Microsoft hasn't yet provided is the "macro" capability. From time to time, you'll probably find some particular sequences of keystrokes or menu selections that you want to repeat often.

For example, you might finish a document, then decide you want to have the word "Word" show in italics throughout the document. Unfortunately, you can't include formatting commands in a global search-and-replace. So, it would be necessary to select each occurrence of "Word" and modify the characters. This would be a much easier process if the series of key strokes could somehow be saved and played back.

For instance, the software might allow you to program a special-function key: hit it, and it would replay the sequence. Also, some operations might be improved if a sequence could be stored in a disk file.

To some extent, both the style sheets and the glossary can do many of the jobs that other word processors use macros for. But there's no way to store a series of menu selections.

(Although some menu-driven programs do support macros, the programming to provide a full macro capability seems to be more difficult in a menu-driven program than in a command-driven program. In the latter, it is relatively simple to write the program so that it can get instructions from a disk file as well as from the command line.)

Microsoft has just added a key-macro option to the latest issue of its Multiplan spreadsheet; it would be a good addition to Word.

Next, Word provides both repagination and hyphenation, but not at the same time. Each must be conducted as a separate step—even though hyphenation may change a line count, and repagination with new margins may change the words that need hyphenation. Consideration should be given to allowing these operations to run simultaneously in any future upgrades.

Another problem became noticeable to me during hyphenation, when I was using the option that allows you to approve or disapprove Word's selected hyphen position. It was difficult to find the cursor when the system paused for the verification. The solid-block cursor gets lost in the maze of letters; it would be easier to find if it was blinking during this process.

Another improvement could be made to Word—and to practically every other word processor currently available. The first word processing system available for a Heath system was Autoscribe, which ran under the Heath Disk Operating System. Each time you created a new document, you could add a description of it to the file. If you forgot the file name, Autoscribe would at least let you find the one you wanted based on the description. When there's more than one user having to access the same files, this type of description becomes even more valuable in tracking down items.

Is it for you?

Microsoft has continued to support Word since its initial issue. Updates have been offered on an approximately annual basis, and the cost to registered owners has usually been around $50. With the competition in the software market becoming more intense, there is no doubt that Microsoft will make further updates to Word, with many more enhancements and improvements.

If you've just purchased a new computer system or are considering an upgrade to a printer that includes special capabilities and a variety of printing fonts, you may want to examine the potential of the new Word.

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Z100 Notebook

William N. Locke

This issue, the Z100 Notebook contains reviews of some major products available for the Z100. These include upgrades to the EasyPC board set from UCI, the C Scientific Library from Eigenware, and the Golden Graphics System from Golden Software. It is no secret that I am a strong supporter of the Z100. There are some companies out there that are willing to help keep the Z100 going in both the business and personal marketplaces.

The Code Corner this issue uses a C program to demonstrate the use of directory search functions under the Microsoft Disk Operating System (MS-DOS).

UCI continues superb support of the Z100

As you know from a past "Z100 Notebook," I am an EasyPC user. (See the "Z100 Notebook" in *Sextant* #23, July-August 1986, for my comments on UCI Corporation's three-board IBM-emulation package.) I don't own many IBM-specific programs, but I use the EasyPC to test software that I write.

I recently purchased another Z100 (an eight-megahertz variety that I virtually stole from Heath for less than nine hundred dollars). When I installed my EasyPC in the new machine, I observed a troublesome matrix of dots on the screen whenever the machine was in a graphics mode.

I called UCI and got the following response, "Oh, we've made many changes to those boards. If you've had your boards for less than a year, send them back and we'll send you an update." I believe that this is the best service I have ever seen in the world of microcomputers.

When I received the replacement EasyPC from UCI, it came complete with a new manual that included block diagrams and some technical information describing the system's operation. This information did not come with my earlier version of the product.

Once I had the new boards installed, the EasyPC was alive at eight megahertz. But I was using a NEC V20 as the '100's central processing unit (CPU), and this caused the EasyPC to act strangely. It would continuously print *P*'s on the screen whenever it was in the IBM-PC mode. The Z100 mode did continue to function. After I replaced my NEC V20 with the Intel 8088 chip designed to be in the system, everything worked fine.

UCI has informed me that the V20 problem may be solved by replacing two chips in the bus-control circuitry. The 74ALS10 chip at location U235 is replaced with a 74LS10. And the 74ALS244 chip at U241 is replaced by a 74LS244.

I have not tried this fix yet; but judging from UCI's track record with the Z100, it's a good bet that the EasyPC will work with the NEC V20.

UCI has added some new optional boards to the EasyPC system. You can now get a communications board, and there's a board designed to allow use of the Intel 8087 math co-processor chip.

. . .Communications boards

The communications package will take up one S100 bus slot in the computer. There are actually two versions of the communications board available: the first costs $99, and has one RS-232 serial (COM) port; the other costs $139, and has two RS-232 ports. The two-port board also provides a clock powered by a small battery, and has a "Game Port," allowing the use of joy sticks. UCI provides the software necessary to use the clock.

The communications boards allow the machine to run unmodified IBM-compatible modem software. Without a board, EasyPC communications requires software that communicates through the Z100 ports or via the routines in the basic input/output system (BIOS) stored in the Z100's read-only memory (ROM). This is due to differences between the input/output (I/O) chips used in the Z100 and those used in the IBM PC; these differences could not be overcome without new serial-port hardware.

Installation of these communications boards requires you to modify the EasyPC's system board. The system board is removed, and two small wires on it cut; two other wires are then soldered in place.

Additionally, you need to use an IC socket supplied with the package to make up an adapter socket for the system I/O decoder ROM chip (U179 on the Z100 motherboard). The decoder ROM is removed and placed in the adapter socket. The adapter socket is then placed in the decoder chip's original socket. One pin from the socket adapter must have a wire soldered to it, and this wire is routed to a plug on the communications board.

The communications board plugs into a spare S100 slot. The cables for the ports can be either routed out the back of the Z100 or attached to the back panel.

For a modem program to check out these ports, I used REACH, from The

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Software Toolworks; the ports worked without a hitch.

. . .8087 board

This is the least expensive way I know of to install an 8087 in a Z100. The board itself costs $70, and you don't need to have the EasyPC in order to use it. As of now, however, the 8087 chip itself is not supplied with the board.

UCI told me they are looking for a good source of the 8087 chips. I purchased one from RAM Technologies of Nashua, New Hampshire. Unfortunately, 8-MHz 8087s are expensive, typically around $160.

The 8087 board is a small, 3″-by-5½″ board; it has a strap connector that runs to the 8088 socket (either on the EasyPC, or on the machine motherboard) and plugs in there. Both the 8087 and the 8088 microprocessors plug into sockets on the 8087 board.

Installation can be done quickly and without surprises.

The 8087 chip itself does not wind up positioned between any boards. UCI has designed this modification such that the portion of the additional board containing the 8087 sticks out beyond the video-logic board near the computer power supply; it is cooled by the computer's ventilation air flow.

The overall UCI system seems to be a prize. I simply cannot understand the motivation of people who sell their Z100s to gain IBM compatibility. I now have an 8-MHz computer that operates as a Z100, as an IBM PC, and as a CP/M machine. It has an 8087, and a total of four serial communications ports. I most strongly recommend this setup.

Computing for the scientist or engineer in us all

There is no doubt that the microcomputer today has placed the ability to do many complex and interesting things into the hands of all of us. Not long ago, if you were to attempt to learn much in terms of engineering or science, there would come a point beyond which you could not travel without the university computer. That day is largely gone.

Today, there is little being done with the large university systems that could not be done, at least in part, by the systems that sit on our desks at home. I can foresee the day when there will be little left for large centralized systems. Instead, nearly all work will be done by "small" systems, sometimes networked.

Here, I'll address an interesting example of transporting the university computer into the homes or offices of the Heath/Zenith user: the C Scientific Library (CSL), from Eigenware Technologies.

First, a warning: if you do not have an 8087 math co-processor installed in your computer, this library will not run. (The advantage of having an 8087 has been discussed in detail in *Sextant* #21, "Speeding Up Your '100 or '150 With the 8087 Math Chip," by Alan T. Moffet. Besides the UCI board discussed above, the co-processor may also be installed using boards supplied by Heath/Zenith or as part of the Gemini IBM-PC emulator.)

The C Scientific Library is an extensive collection of the sorts of functions usually found in university computer libraries. They are powerful, fast, and easy to use. The cost is $245.

The version of the library that I tested was written for the C compiler from Computer Innovations, which supports both the Big-memory and Small-memory program models. The library is also available for the Microsoft C Compiler using the Small-memory, Medium-memory, and Large-memory programming models. (These memory models allow programs to work with different combinations of code areas and program-data areas in sizes greater or less than 64 kilobytes; their names are a function of the compiler used.)

Most of these functions are simple but time-consuming. Computers do this work much faster.

CSL is cleanly organized into five classes of functions. I'll discuss each class briefly.

I. Matrix manipulation:

This section of the library contains all the most frequently used functions for manipulating matrices. These include the ability to add, subtract, multiply, transpose, invert, and find Eigen values and vectors.

Matrix analysis is used in many fields of engineering and science. It is also needed in much of the processing of graphics images done for computers. As an example, the three-dimensional rotation of a screen object is a matrix-analysis problem. (Some large computer designs are specifically optimized for these matrix manipulations.)

II. Differential equations:

Several different approximation methods for the solution of differential equations are provided. These include some of the most advanced techniques available. Not only can systems of linear and many-order equations be solved, but techniques exist for approximating the solution of nonlinear differential equations.

Approximation methods are also common to all branches of engineering and science. As an example, rapid solution of a differential equation might be required for control of a robot: if you want exact positioning of the arm without hunting, you have to include the rate of arm motion in the calculations that determine when to start slowing the arm down and at what rate.

The library also contains several techniques for finding the slope of a function and the area under a curve. These are some of the most basic problems of calculus, but in complicated cases they need numerical approximation.

III. Finance:

One section of the C Scientific Library is designed for financial computation. The section is short, but contains some useful functions. They include provisions for computing depreciation, future values of an investment, and conversion from nominal annual interest rates to annual percentage rates. (These functions would be most valuable to the individual who strikes it rich using the rest of the functions in this library, invests the money in the microcomputer industry, and retires to the Greek islands.)

IV. Special functions:

This section contains routines for computing special function values. These go well beyond the standard trigonometric functions of sine and cosine, etc. The routines include functions such as Bessel functions, the Gamma function, Fibonacci numbers, Chebyshev and Legendre polynomials, and others.

I remember the days when I would go hunting in the university library for a book with tables of these functions in the range that I needed. It seems somehow unfair that today all that's necessary is to ask the home computer.

Most of these functions are simple to compute but time-consuming. They are often generated from recursion relations (i.e., one case is generated from previous cases). Computers do this sort of work much faster than I did as a twenty-year-old student.

In many cases, the use of special functions has been diminished by the advent of computer solutions to differential equations. A decade ago, we found the solution to an equation in terms of a series of special functions (such as Legendre polynomials); today, it is quicker and more accurate to use an approximation technique to step out the solution of the differential equation. The computer has changed the entire way in which we think about solving problems.

V. Statistical analysis:

The CSL provides all the standard statistical functions. These include code for computing random variables, means, variances, moments, etc.

A full range of probability functions is provided, as are facilities for doing regression analysis, Fourier transforms, and so on. These are advanced statistical tools, and having them available can save a considerable amount of research.

Other sections of the library include facilities for mathematics using complex numbers, limited graphics support,

and sorting.

This Eigenware product is, without doubt, impressive. I do not usually measure the value of documentation by its weight, but the massive volume included with this library is exhaustive and superb. Each function is described with examples of its use and explanation of its input, output, and storage requirements. Further, a reference is given for the algorithms used by many of the functions in the library.

If you are endeavoring to do engineering or scientific work with your computer, you can certainly develop your own library of technical functions. But use of this library will save a large amount of your computing time while allowing you to solve the problem at hand.

The documentation states that much of the code was ported from a large university system. I suspect that there were many years of work involved.

Displaying scientific information

The usual product of scientific calculation is a large quantity of numbers. These were once spewed from the IBM 360 mainframe at my school at a rate that would keep any paper mill busy. A printed list is all we got. These lists were far better than computing answers with a slide rule, but they stopped short of being an optimal presentation. Today, there is a virtual feast of displays for large computer systems—graphics terminals, plotters, laser printers, and so on.

One of the first things that I wrote for the H89, my first computer, was a BASIC program that could display graphs on the screen. It used the H19 block-graphics character set, and yielded a 48-x-80 resolution—hardly a high-resolution display. (H19 graphics characters are a set of figures that can replace the lowercase characters; this graphics mode is available with the H19 terminal and the H89 computer, and is also available on the Z100.)

There is now a powerful plotting package available to Z100 users. The product is from Golden Software, Inc., and is called the Golden Graphics System. I should note that this product is also available for the IBM-PC compatibles.

The Golden Graphics System costs $299, and consists of five major modules. I'll explain each briefly.

QGRID is used to prepare your data for plotting. It contains some complicated routines to estimate a proper set of evenly spaced points for drawing surface or topographical maps.

These routines act on data provided by the user's application program. Input data must be provided to the QGRID program in a file with x,y,z values for each data point on its own line. It is up to the user to design the application program to produce the input file in this format. (The data doesn't have to be produced mathematically. It could be just a series of x,y,z measurements; QGRID will process it for plotting.)

By way of example, a typical file might look like this:

```
0,0,0
1,1,2
3,4,8
. . .
```

There are actually two algorithms available to do gridding. The default algorithm is known as the Inverse Distance Squared. It is fairly quick, but gives a somewhat rough result. The other algorithm available is the Kringing smoothing technique. The Kringing technique produces a nicer curve, but the IDS gridder is as much as ten times faster.

To smooth out the final curves, the user may vary the degree of dampening; this will reduce the impact of rapid fluctuations in the data that would result from the scattering of data around a curve.

SURF will plot a three-dimensional surface on the screen of the Z100 or on an IBM compatible. In addition, it will create a file that can be used by the PLOTCALL functions (explained below) to plot the surface on a printer.

SURF is remarkable. The surface can be plotted in any position: it can be rotated in the x,y plane, and it can be rotated so that the view given is from varying altitudes. It may be plotted with or without hidden-line removal. And the user may select to see only the top surface, only the bottom surface, or both.

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For an example, Figure 1 is the result of plotting the equation:

Z = EXP(X*Y/100)*SIN(X*PI/2)*SIN(Y*PI/2)

with both X and Y ranging from 0 to 10.25 in steps of 0.25. The data was produced by the few lines of C shown in Listing 1. (The QGRID program required several hours to process the 1,681 resulting data points.)

TOPO is used to produce topographical plots of the same surfaces plotted with the SURF module. These plots are useful for quantitative analysis of the surfaces. When printed on a dot-matrix printer, the topographical plots can have line values indicating altitudes (as shown in Figure 2), making analysis simpler to perform. Figure 2 is a TOPO plot of the same data used to create Figure 1.

GRAFIT is used for making plots of two-dimensional data. It supports bar charts, line charts, pie charts, and high-resolution x,y plots. These graph and chart routines are well planned, and the user has little to do, aside from providing the data. The axes may be labelled, and the scaling may be either automatic or controlled by the user. Finally, the graphs may or may not, at the user's option, have grid lines automatically drawn.

PLOTCALL contains the programs necessary to print the files produced by SURF, TOPO, or GRAFIT. The list of supported printers is extensive, and I recommend that you call Golden Software if you fear that your dot-matrix printer is not supported.

The printer plot sizes may be adjusted to meet the user's needs. Both Figure 1 and Figure 2 were created by these plotting commands.

Printer drawing is done with "pen commands" contained in an input file. These pen commands use locations and operation codes in the following format: x,y, <op code>.

The operation codes are:

1—Change the origin location.
2—Drop the pen and move to x,y.
3—Raise the pen and move to x,y.
4—Output a symbol string from a font file. (The package includes a number of symbol and character fonts.)
5—Select a symbol set (from a font file).
6—Scale the data.

I can imagine several applications for the PLOTCALL package, besides printing the results of the SURF, TOPO, and GRAFIT programs. Virtually anyone familiar with computer graphics should be able to quickly go to work with this tool at hand.

My overall impression of the Golden Graphics System is that it is a powerful, ready-to-run piece of software. There is no doubt that it is the result of a considerable amount of work.

Both the CSL and the Golden Graphics Software packages fall in a price range that puts them at the top edge of what a home user is likely to pay for a software product intended for frequent use. Both are professional packages, and if you are

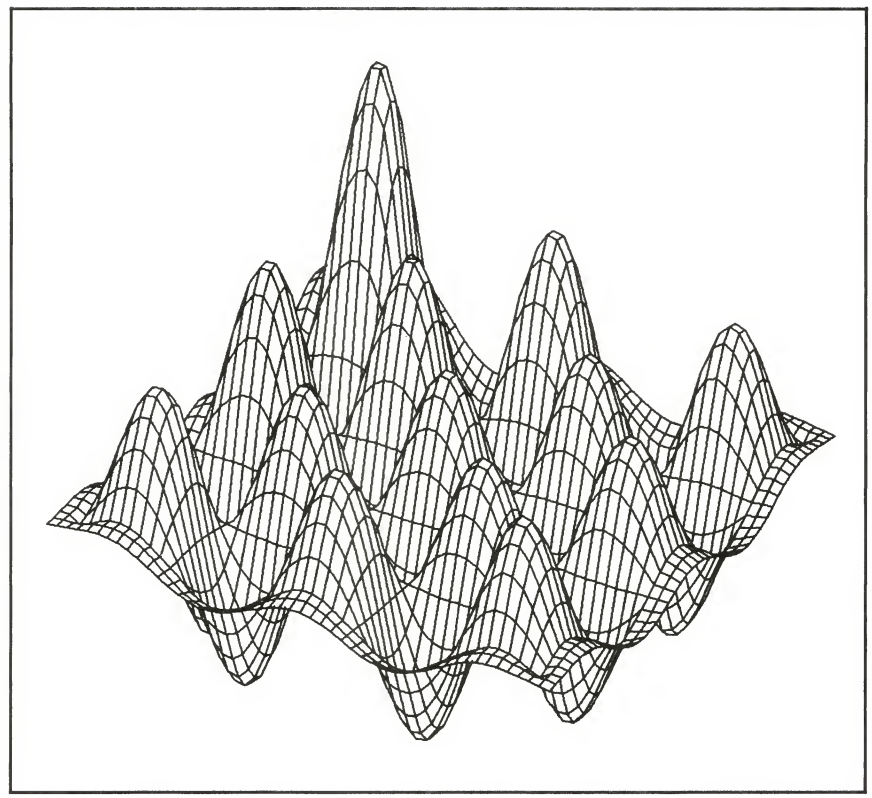

Figure 1. What if Z = EXP(X*Y/100)*SIN(X*PI/2)*SIN(Y*PI/2)? The C program in Listing 1 produced a file of 1,681 discrete x,y,z positions based on that formula. These were processed by Eigenware's QGRID program so that the values could be accepted by SURF, which produced this figure.

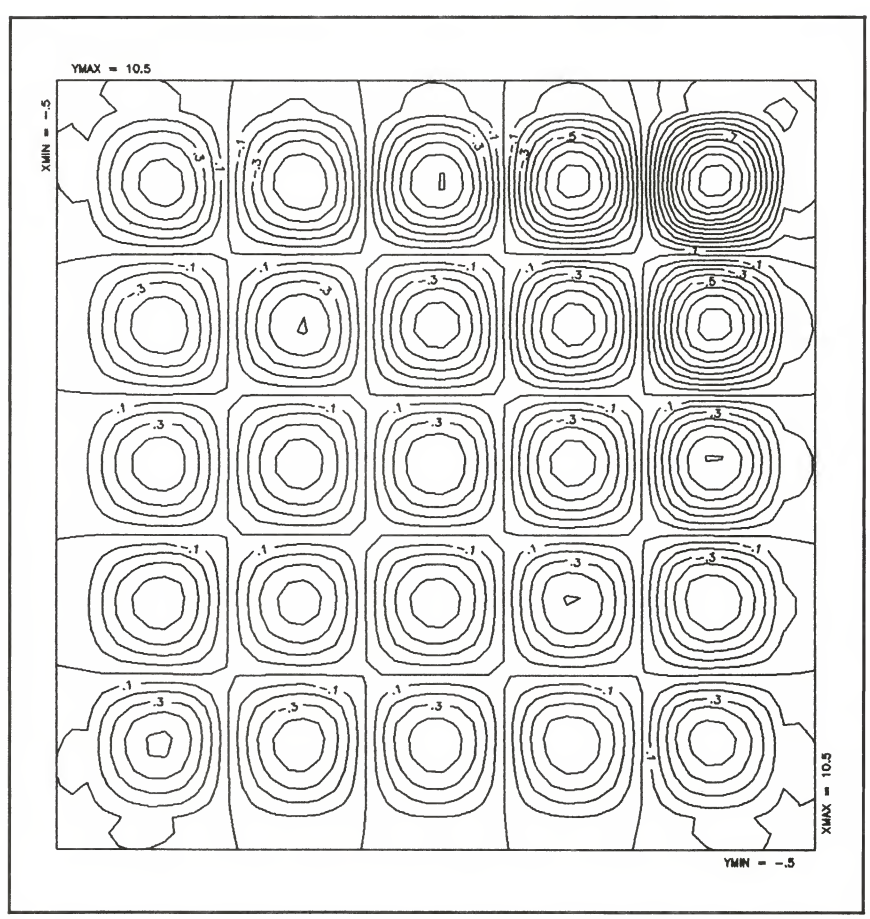

Figure 2. A topographical map, produced by TOPO, based on the same 1,681 x,y,z points that SURF used to produce Figure 1. This map has been rotated 90 degrees relative to Figure 1.

```
#include <stdio.h>
main(){
      double  x,y,z,w,exp(),sin();
      w = 3.1415/2;
      for(x = 0 ; x <= 10; x= x+0.25)
          for(y = 0 ; y <= 10; y= y+0.25){
              z = exp(x*y/100) * sin(w*x) * sin(w*y);
              printf("%f,%f,%f\n",x,y,z);
              }
      }
```

Listing 1. A short C program to generate points satisfying the formula Z = EXP(X*Y/100)*SIN(X*PI/2)*SIN(Y*PI/2). This program produces 1,681 discrete x,y,z values. These were processed by Eigenware's QGRID to produce a file that can be accepted by SURF and TOPO to produce the surface and topographical maps shown in Figures 1 and 2, respectively.

Listing 2. Written for the DeSmet C Compiler, nbdir.c demonstrates code for reading an MS-DOS directory. It gives you a sorted directory, and accepts wild cards in the drive and path specifications.

```
/*                Z100 Notebook Directory Demonstration ( nbdir.c )          */
/*                     William N. Locke (c) Nov 1986                         */
/*                                                                           */

#include <stdio.h>        /* DeSmet C standard input output header           */
#define MODE     0x3F     /* This is the MS-DOS attribute search mode ( ALL ) */
              /* 0x00 - Normal files, 0x01 - Read only, 0x02 - hidden        */
              /* 0x04 - system,       0x08 - volume ,   0x10 - subdirectories*/
              /* 0X20 - Archive                                              */
              /* To combine "OR" the values: Normal + R/O + SUBDIR = 0x11    */
#define MAX_FILES  200   /* This is the maximum file pointer array length    */
#define SET_DTA    0x1A  /* Function code for setting the Data Transfer Area */
#define DTA_SIZE   128   /* Standard MS-DOS Data Transfer Area size          */
#define INT21      0x21  /* Interrupt number 21 hex used with doint() below  */
#define FIRST      0x4E00/* Function for finding first match                 */
#define NEXT       0x4F00/* Function for finding next match                  */

typedef struct { /* Data structure type to be used declaring file structures */
     char reserved[21];     /* Not available for use                         */
     char attribute;        /* File attribute                                */
     unsigned time;         /* Last file access time                         */
     unsigned date;         /* Last file access date                         */
     long size;             /* File recorded size                            */
     char fname[13];        /* File name <fname.ext>                         */
     } *FILE_STRUCT_PTR,    /* Type used to declare  file structure pointers */
       FL_STRUCT;           /* Type used in sizeof() statement below         */

/*                              *** main() ***                               */
/*                                                                           */
/* Returns a sorted directory of the default drive or   drive path indicated */
/* by the command line prompt:  nbdir <drive>:<file specification>           */
main(argc,argv)
int argc;
char *argv[];{
     FILE_STRUCT_PTR  first_file(), next_file(), file_ptr[MAX_FILES];/* PTRS */
     char file_specification[128];
     int index, index_max, sort_flg, sort_test, sort_temp;
     if(argc <=1 )strcpy( file_specification, "*.*");/* No Command line input*/
     else strcpy( file_specification, argv[1]);/* Copy command line input to */
                                              /* the file specification     */

/* Search for the first file on the disk directory that matches the condition*/
     file_ptr[0] = first_file(file_specification,MODE); /* pointer  to array */
     if(file_ptr[0] == NULL){ /* If structure pointer is NULL no match found */
          printf("No files\n"); /* Print message and quit the program        */
          exit();
          }
/* Place subsequent file pointers in array until no further matches are found*/
     index = 1;
     do{
          file_ptr[index] = next_file();/* next pointer  in file ptr array   */
          } while ( file_ptr[index++] != NULL );/*Check for NULL (last file) */
                                  /* Index is incremented after check is made */
     index_max = index-1; /* index_max = Maximum array index including NULL  */
                          /* index_max = Total matching files encountered    */

/*                         File Sequence Sorting routine                     */
/* This code sorts the array of file structure pointers to place the         */
/* file names in alphatical order. Uses a standard swapping sort routine.    */
     sort_flg =1;
     while( sort_flg){  /* Keep going as long as any swaps occured           */
          sort_flg =0;  /* Set to zero to test if swaps occured              */
```

→

interested in doing scientific or engineering work, I strongly recommend them.

Code Corner—reading the disk directory

This issue, the Code Corner is dedicated to demonstrating a basic feature of the operating system: reading the disk directory. I will present a simple directory program, but my main purpose is to give programmers some prototype code for reading the directory from within their own programs.

The directory program in Listing 2 uses features of the operating system that originated with MS-DOS version 2; hence it will not function properly on earlier versions.

. . .What is a disk directory?

Each disk formatted by MS-DOS has an area set aside for the root directory. This area consists of seven disk sectors that follow the boot and file-allocation table (FAT) areas on the outermost disk track. The boot region is one sector, and the FAT is normally four sectors. Each sector is 512 bytes; each circular track will be broken up into either eight or nine sectors depending on how you FORMATted the disk.

Entries are made for each file in the root directory, including system and hidden files. Entries are also made for subdirectories and the volume label. These last two items are not files in the normal

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```
          /* Go through the array checking for the next entry to be          */
          /* less than the last one. If so, swam them and continue           */
          for ( index = 0;index <= index_max-2; index++){
               /* Test by comparing the two file names                       */
               sort_test =
                    strcmp(file_ptr[index]->fname,file_ptr[index+1]->fname);
               if(sort_test >0){ /* Swap if the names are in the wrong order */
                    sort_temp = file_ptr[index];
                    file_ptr[index] = file_ptr[index+1];
                    file_ptr[index+1] = sort_temp;
                    sort_flg = 1;/*Set to one so the while command will cont.*/
                    }
               }
          }

/*                          File name printing section                       */
/* This code is used to print out the file names, attributes and sizes       */
     for(index =0; file_ptr[index] != NULL; index++){
          printf( "%-14s",file_ptr[index] ->fname);
          printf( "Attribute = 0x%-3x  ",file_ptr[index]->attribute);
          printf( "Size = %ld\n",file_ptr[index]->size);
          }
     printf("Number of matching files = %d",index_max);
     }

FILE_STRUCT_PTR new_file,file_dta;   /* Declare file structure pointers      */
extern unsigned _rax,_rcx,_rdx,_rds; /* Used by DeSmet _doint() function     */
extern char _carryf;                  /* for addressing the registers        */

/*                        *** first_file() ***                               */
/*                                                                           */
/* Search for the first matching file                                        */
/* Input: char     *file_specification - A pointer to the file specificaton  */
/*        unsigned mode               - The MS-DOS search mode to be used    */
/* Return: A pointer to a structure containing file data                     */
FILE_STRUCT_PTR  first_file(file_specification,mode)
char *file_specification;
unsigned mode;{
     char *malloc();
     FILE_STRUCT_PTR  file_alloc();
     file_dta = (FILE_STRUCT_PTR) malloc(128);
     _os(SET_DTA,file_dta); /* Set the data transfer area to "file_dta"      */
     _rds = -1;             /* Use the existing data segment by inputting -1 */
     _rdx = file_specification;  /* Place file spec pointer in the DX reg.    */
     _rcx = mode;                /* Place search mode in the CX register      */
     _rax = FIRST;               /* Place function code in AX                 */
     _doint(INT21);              /* Do an interrupt 0x21 modifying registers  */
     if( _carryf )return NULL; /* Return NULL if no files are found           */
     new_file = file_alloc();
     cpy_struct( new_file, file_dta);
     return new_file;
     }

/*                           *** next_file() ***                             */
/*                                                                           */
/* Search for the more matching files                                        */
/* Input: Nothing                                                            */
/* Return: A pointer to a structure containing file data                     */
FILE_STRUCT_PTR  next_file(){
     FILE_STRUCT_PTR  file_alloc();
     _rax = NEXT;               /* Place function code in AX                 */
     _doint(INT21);             /* Do an interrupt 0x21 modifying            */
     if( _carryf )return NULL;  /* Return NULL if no files are found         */
     new_file = file_alloc();   /* Allocate space for the new file structure */
     cpy_struct( new_file, file_dta); /* Copy data to the new file structure */
     return new_file;        /* Return the pointer to the new file structure */
     }

/*                           *** file_alloc() ***                            */
/*                                                                           */
/* Allocate the space for a file structure pointer                           */
FILE_STRUCT_PTR  file_alloc(){
     return  ( FILE_STRUCT_PTR ) malloc( sizeof( FL_STRUCT ));
     }

/*                           *** cpy_struct() ***                            */
/*                                                                           */
/* Copies one file structure to another (Both structures must be allocated)  */
cpy_struct(new_struct, old_struct)
     FILE_STRUCT_PTR  new_struct, old_struct;{
     new_struct->attribute = old_struct->attribute;
     new_struct->time = old_struct->time;
     new_struct->date = old_struct->date;
     new_struct->size = old_struct->size;
     strcpy( new_struct->fname , old_struct->fname );
     }
```

sense, but MS-DOS uses the directory area to manage them. Subdirectories are entirely similar to the root directory except that there is no fixed location for them; the operating system simply puts them as close as possible to the beginning of the disk (the outer edge).

In the directory, the entry for each file occupies 32 bytes and follows a specific format. This format is used to record all the information needed to provide either the operating system or a user program with necessary file data, and to locate the start of the file in the file-allocation table.

The format is shown in Table 1. The information given is as follows:

File Name

First is the name assigned to a file, with a maximum of eight letters. This name is stored using normal ASCII text characters.

File Extension

Next is the extension associated with each file name; it has a maximum of three letters (.DOC, .TXT, .C, etc.).

File Attribute

The file attribute is a single-byte entry used to specify the type of file referenced by the directory entry (read-only, hidden, etc.). These codes are shown in Table 2.

Reserved Space

The ten-byte directory field labelled "Reserved" has no meaning at this point. This field is being saved for possible future use in MS-DOS.

File Write Time

The time field shows the time the file was last written to. This entry is a two-byte code specifying the hour (0 - 23), minute (0 - 59), and second (0 - 59) as follows:

Time = hour * 2048 + minute * 32 + second / 2

The time code may be decomposed back into its parts as follows (using C's % to indicate modular division):

Hour = Time / 2048
Minute = (Time % 2048) / 32
Second = (Time % 32) * 2 (two-second increments)

File Write Date

The date field shows the date the file was last written to. This is also a two-byte code; it specifies the year (offset from 1980: 0 - 119), month (1 - 12), and day (1 - 31) as follows:

Date = (Year - 1980) * 512 + Month * 32 + Day

The date code may be decomposed back into its parts as follows:

Year = Date / 512 + 1980
Month = (Date % 512) / 32
Day = Date % 32

FAT Start Number

This number points to the position in the file-allocation table that gives the file's starting location. It is used by MS-DOS to find the disk location of the beginning of the file.

File Size

This four-byte unsigned number is the

file size in bytes. (Using C, it may be accessed as a "long integer.")

. . .Finding files in the directory

The disk directory may be accessed by using MS-DOS function requests. The specific function request to be performed is determined by a value placed in the CPU's AH register prior to executing the function-request interrupt (system interrupt number 21 hexadecimal). Other registers are used to input data to the interrupt routine prior to execution of the system function.

The two functions we'll be using will place the file-directory information in a special data region known as the data-transfer area (DTA). The DTA is normally in the program segment header. (The program segment header is an area in memory immediately before the program code. The operating system sets up this area and uses it to communicate with the program; for instance, the program goes there to get information such as the total size of RAM.) Our C program will give MS-DOS a new address for the DTA (set disk transfer address, function call 1A hex). This address will be in the data segment, making the DTA information more easily accessible.

The format of the data in the DTA is nearly the same as in the directory itself—except that the information is in a different order, and the file name and extension (including the period) are reported in one field (<FNAME>.<EXT>). Table 3 shows the order used by MS-DOS's directory function requests.

Directory access is handled by two function requests (using different values for register AH). The first (find first matching file, AH = 4E hex) is used for finding the first file that meets a certain set of conditions. The second (find subsequent matching file, AH = 4F hex) is used for finding another file meeting the same conditions. (I refer to them as FIRST and NEXT in Listing 2.)

In a relatively limited space, I can't go into much detail about these two functions; but a brief description of their entry-and-return protocols is as follows:

FIRST:

For calling, AH = 4E hex; registers DS:DX contain a pointer to the location of the first byte of the string specifying the search path. (Wildcards are allowed in the search path.) CX = Search attribute. (See Table 2 for the value of the file attributes.)

Upon return from FIRST, if the Carry flag is not set, directory data is placed in the DTA. If the Carry flag is set, and AX = 2, this means that no file was found; if AX = 18, it means that no more similar files can be found.

Note: 1. The search attribute could be 08h, which applies only to volume labels; if that's the case, and the search file name is a volume label, only that label will be

Disk Directory Entry Format

File name	8 bytes
File extension	3 bytes
Attribute	1 byte
Reserved	10 bytes
Time	2 bytes
Date	2 bytes
FAT start number	2 bytes
File size	4 bytes

Table 1. In an MS-DOS DIRectory entry, information on a file is kept in a 32-byte format. (See text for comments on the individual elements of a directory entry.)

MS-DOS Directory Report (Function requests 4E and 4F)

Reserved	21 bytes
Attribute	1 byte
Time	2 bytes
Date	2 bytes
Size	4 bytes
File name	13 bytes

Table 3. File data in the data-transfer area (DTA) contains the same information as a file's directory entry (Table 1), but in the format used by MS-DOS's directory function requests. (The 13th byte in the file name is a hex 00 to terminate the string.)

File Attribute Value and Meaning

Normal File
00 hex
This file is a normal file, and has been backed up using MS-DOS's BACKUP command since being written to.

Read-Only File
01 hex
This file may be read, but it may not be erased or written to.

Hidden File
02 hex
This file will not be found when the directory is searched.

System File
04 hex
This file is an MS-DOS system file, (e.g., IO.SYS or MSDOS.SYS). It is not found during normal directory searches.

Volume Label
08 hex
This code may exist only in the root directory; it indicates that the entry is the disk volume label.

Subdirectory
10 hex
This entry is a subdirectory designation.

Archive File
20 hex
This entry is a normal file that has not been backed up using MS-DOS's BACKUP command.

Table 2. File attributes under MS-DOS. Note that the binary equivalents of the attribute bytes contain only one "1", the rest of the digits being zeroes (2 = 00000010; 10 = 00010000, etc.). This enables the attribute byte to be easily subjected to bit manipulation. (See the comments at the beginning of nbdir.c, in Listing 2.)

found. If the search attribute is anything other than 08h, then normal files will be found, as well as the type of file specified.

2. The search path must be completely specified. For example, to find all the files in the subdirectory TEST on drive B:, the path string would be: B:\TEST *.*.

NEXT:

For calling, AH = 4F hex. Other information, including the DTA address, must be the same as for the 4E function request.

On return from NEXT, if the Carry flag is not set, directory data is placed in the DTA. If the Carry flag is set, and AX = 18, it means that no more similar files exist.

. . .Moving the data-transfer area (DTA)

Well, now we want to access the directory data obtained by the FIRST and NEXT system function requests. As mentioned above, it is convenient to move the DTA from the program segment to the data segment. This is done using the set disk transfer address function (AH = 1A hex). The base address of the desired DTA segment is placed in the DS register, and the desired DTA offset is placed in DX. When the interrupt is performed, the DTA is moved.

The function library of the DeSmet C compiler allows this to be performed using the function

_os(funct_num, DS_val)

where funct_num is 1A hex, and DS_val is a pointer to a previously allocated area in the data segment. Other compilers use a function similar to _os( ) for this purpose, and the reader should be able to modify the example code to work.

. . .The example program

The code provided in Listing 2 as an example is a directory program; it provides a sorted list of files on a path, and the list includes file size and attributes.

Taking a look at the use of several particular C features should make the code easier to understand.

The doint( ) *function:*

DeSmet C uses the doint(intnum) function to perform interrupts. The procedure for using this function is as follows:

1. Declare the external variables as needed; in our case:
_rax, _rbx, _rcx, _rdx, _rsi, _rdi, _res, _rds, _carryf, _zerof

2. Set these external variables as required by the specific interrupt to be used.

3. Call doint(intnum), with intnum equal to the number of the desired interrupt. In this case, intnum will be 21 hex (0x21 in C).

4. Read the result of performing the interrupt by reading the new values of the external variables listed above.

The typedef *declaration:*

Just after the #define statements at the start of the example program, the typedef struct . . . code appears; this is a C form that is not often used. The purpose of this code is to construct a data type that is a structure with the components required by the DTA data used by our system function requests. FL_STRUCT is the structure type itself, and FILE_STRUCT_PTR, is a pointer type pointing to a structure.

For example:

```
FL_STRUCT my_struc; /* Declares a
  structure */
FILE_STRUCT_PTR my_struct_ptr;
  /* Declares a structure pointer */
```

The actual code:

The actual code in Listing 2 is commented, so it should be able to be followed on its own. The major function purposes are as follows:

A. The function main( ) drives the program in the following sequence:

1. Read the command line if present.

2. Search for the first directory entry matching the command-line specification. In the array of pointers (file_ptr[ ]), place a pointer to that directory structure for later use.

3. Search for subsequent directory matches, placing the resulting structure pointers in the file_ptr[ ] array.

4. Sort the file_ptr[ ] array such that files appear in alphabetical order by name.

5. Print out the directory information by name, attribute, and size.

B. The function first_file( ) is used to do the following:

1. Move the data-transfer area (DTA) to the data-segment block (file_dat), which was obtained from the call on malloc( ).

2. Do interrupt 21h (explained above). If no files are found, quit and return a NULL.

3. Copy the resulting structure at file_dta into a new structure called new_file.

4. Return a pointer to new_file for use in main( ).

C. The function next_file( ) is used to do the following:

1. Do interrupt 21h as explained above. If no files are found, quit and return a NULL.

2. Copy the resulting structure at file_dta into a new structure called new_file.

3. Return a pointer to new_file for use in main( ) as explained.

As usual, the source code, nbdir.c, and an executable version, nbdir.exe, will be uploaded onto the HUG SIG on CompuServe. If you prefer, for $20 I will send you a disk copy of both (along with previous "Z100 Notebook" programs). Mail requests to William N. Locke, P.O. Drawer M, Hampton VA 23666.

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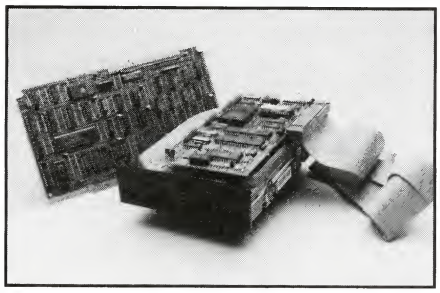

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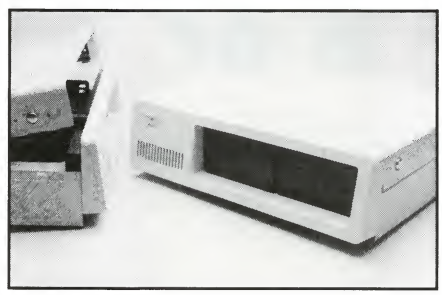

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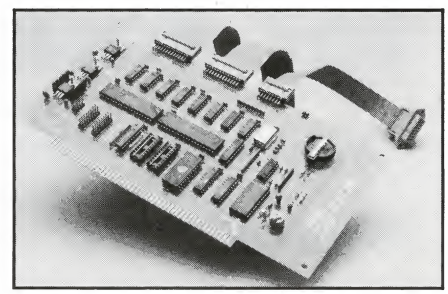

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Cassette Tape Back-Up for Your '8 or '89

A review of a set of CP/M utilities, with hints for making the most of them.

George M. Ewing

TapeIO is a collection of CP/M utility programs from Kandueazy Computer Software Services (KCSS) of Alexandria, Virginia. Using these utilities will allow you to interface cassette tape to your H8 CP/M operating system using the H8-5 cassette board, or to your H/Z89 computer using the H88-5 cassette input/output (I/O) board.

If you have a working cassette board, no additional hardware modifications are needed. If you don't have a cassette board, it's not too hard to obtain one secondhand.

First of all, Jim Kandul of KCSS should have made this package available when the H8 and H89 were still new, and every H89 kit came from the factory with a cassette I/O board in it whether you wanted it or not. And new 100-kilobyte H17 disks cost four or five bucks *each* in retail quantities. If Jim had made this software available then, he would surely have sold a zillion copies and made a fortune, even at a much higher price than forty bucks!

Despite newer technologies that are making cassette tapes obsolescent, there are still two distinct classes of customer for this package.

Likely customers

The first group who will probably greet this software with cries of joy and then reach for their checkbooks is composed of the numerous old-timers who got an H8 or H/Z89 early. They are the ones who have lots of old games, Benton Harbor BASIC programs, or extensive text files sitting around on tape; but they have never gotten around to typing them into their machines as CP/M files, even though they upgraded to a disk operating system some time ago. (These people will probably want the full TapeIO version 1.5 with the PROGRAM utility, described below.)

The other likely customers are hobbyists like me. They don't have a lot of experience with the old Heath tape system. They aren't particularly interested in B.H. BASIC—or they have already put their B.H. BASIC files in CP/M or HDOS form by some other means.

These people just need an inexpensive way to back up their CP/M disk files for archival reasons—while waiting for the newer high-density floppy, hard-disk, and streaming-tape systems to become more affordable. This particularly applies to users who have a lot of word processing and other text files which must be backed up, but are rarely used. There, the loss of an occasional bit is more tolerable than in a .COM file program, which must be absolutely perfect to run.

> ***The attraction is the ability to stuff a whole novel onto a cassette that costs less than a dollar.***

Here, the attraction is the ability to stuff a whole novel manuscript, which might occupy a half dozen or more H17 disks, onto a cassette that costs less than a dollar. To do it with inexpensive software and free or very cheap hardware is very appealing to a busy student on a budget or to someone who writes for a hobby. (These people may be satisfied with the $25 version 0.0, which does not include PROGRAM, the B.H. BASIC translating utility.)

Those of you who are are thinking about "moving up" to cassettes might want to take a look at the "Cassette Survival Tips," which accompany this article. (Experienced hobbyists can skip that part; turnkey novices, take heed.)

What you need; what you get

The minimum hardware environment is an H8 or H/Z89-family computer with at least one compatible disk drive (H17, H37, etc.), the appropriate cassette-interface board, and at least 32 kilobytes of memory. (32K is needed to support CP/M; TapeIO occupies only 6K of disk space.)

(There may be a conflict between the cassette board and some non-Heath add-on boards in their use of I/O port numbers. If you find yourself in that situation, Kandueazy will provide patching information.)

Kandueazy's catalogue lists three different TapeIO packages; version 1.5, which costs $39.95, includes the following utilities:

BACKUP—makes a tape copy of a CP/M disk file.

RESTORE—reads a tape file, then saves it on a CP/M disk. As it does this, it checks for errors in transmission, looking for block-sequence and cyclic redundancy check (CRC) checksum errors.

VERIFY—checks a tape file for CRC or block-sequence errors, but does not copy it.

TEXT—reads an existing tape file made in the old Heath TED-8 (compressed) format, restores it to uncompressed form, and saves it as an ordinary CP/M disk file.

PROGRAM—converts a Benton Harbor BASIC tape file to a CP/M disk file.

Version 0.0 of TapeIO includes all of the above *except* the PROGRAM utility; as noted above, version 0.0 sells for $25. The PROGRAM utility is available separately under the name BASCONV, also for $25.

Some possible obstacles

I must admit that I was skeptical of TapeIO at first. Right on page 89 of the Spring/Summer 1985 release of the Heathkit catalogue, it said that the

George M. Ewing writes full-time about ham radios and hobby electronics. He does most of his word processing on his H89, and regularly writes articles and product reviews on Heath 8-bit computing.

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Cassette Survival Tips

1. Use decent-quality cassettes. You don't necessarily need super-duper platinum-plated cassettes, but avoid the real junkers—ones you have to pry with a pencil to get the tape spools turning.

2. Keep track of the beginning and end of each file; but don't take the digital counter on your cassette recorder(s) too seriously, especially when transferring tapes from one machine to another. If all else fails and you just can't find the start or end of a block, plug in an earphone or speaker and *listen*. With a little practice, you can distinguish the buzz of the data blocks from the carrier tone; and you can tell a regular block from the shorter header and end-of-file data bursts.

3. Keep meticulous written records and accurate labels of which files are on what tape, and in what order. With a disk directory, you can find a "lost" file in a few seconds; but on slow cassettes cluttered with short files, it could take hours.

4. Keep a bottle of cleaning solvent or 95% isopropyl alcohol (*not* 60% rubbing alcohol) and some Q-Tips handy. Once in a while, clean the loose oxide off the recorder heads, capstan, and pinch roller.

5. To keep the tape from moving whenever the cassette is out of the machine, use hub-holders, even the cheap cardboard kind. A cassette with a loose loop of tape is just like a ball of yarn to a playful cat. And don't forget to be careful if you clean up your work bench with a vacuum cleaner. The nozzle can suck up ten or fifteen minutes' worth of tape in as many milliseconds.

6. Take the same sort of precautions that you would with a valuable disk. Avoid magnets, extremes of heat, humidity, hot coffee, etc.

7. You needn't be a recording engineer, but it doesn't hurt to try to get some idea of the record and playback levels that work best with your recorder and cassette board. Maybe use a scope to see what's coming out and going in, and check for consistent tape speed, etc.

8. It's good to have a shorting switch in parallel with the remote motor control cable from the computer I/O board to the recorder. This lets you save wear and tear on connectors when rewinding, looking for a particular file, etc. Treat all connectors very gently, as if they were made of tinfoil and wax; on some cheaper machines, they are!

9. For really important data, use the shortest, heaviest cassette tapes you can get. A 10K BASIC program two and a half minutes long is better kept on a short cassette with heavy, stretch-resistant tape. It is possible to stuff a long text file like a novel manuscript onto a single C-120 cassette with half-mil tape; but such a tape must be handled *very* gently. This tape is best for last-ditch archival storage, not everyday use; sooner or later, half-mil tape will stretch, and some bits of data will be lost.

HA88-5 cassette board is "not for use with CP/M." Even if TapeIO did work, I wondered whether a plain audio-type cassette system would be reliable enough to be worth the time and trouble.

(My only previous experience with cassette I/O was on a vastly different system—a pair of true digital cassette drives—in the early 70s. They had read-after-write heads and a sophisticated operating system on an old Psycor intelligent terminal.)

Still, the potential economy of easy CP/M backup was tempting.

First, economy of media: local discount stores were selling brand new high-quality C-90 cassettes for 79 cents each—cheaper if you bought a six-pack. Good used audio cassettes were to be had for next to nothing. At 5K per minute, a C-90 cassette should be good for around 450 kilobytes. The longer C-120 size, still as cheap as a 100K H17 single-sided disk, would be good for over 600K!

Next, the necessary hardware looked equally inexpensive. I still had the cassette I/O board that came with my H89 years ago; it was still unused in its conductive plastic bag if I could only find it. Heath no longer carries the board in its catalogue, but local HUGgies had plenty of spares. Even Heath had charged only $25 for a brand new board—although that "not for use with CP/M" warning still worried me a little.

Cassette recorders were readily available. I still had my trusty Radio Shack CTR-37 recorder from amateur-radio code practice classes years ago, and good used machines were going at local flea markets for as little as five or ten dollars.

I ordered the 1.5 version of TapeIO, and when it arrived, I opened up the grey box. My first attempt to boot the machine with a cassette board plugged in was unsuccessful; no H: prompt. Two borrowed spare boards also refused to work. This was not the fault of the software; the CP/M program could hardly be expected to load if the hardware wouldn't let me bring the machine up.

From previous experience, I knew there were several different versions of the basic H/Z89 computer: the H89, H89A, Z89, Z90, etc., all with slightly different arrangements of cables, sockets, jumpers, and shielding. Likewise, the read-only memory (ROM) could have one of at least three different sets of monitor routines: MTR-88, MTR-89, or MTR-90.

Further complicating the matter was the fact that Heath sold at least two different layouts of the HA88-5. An older version, the 85-2218, was laid out around 1979. A newer version, the 85-2552, with a 1981 design copyright, was physically quite different. But the technician at the Tampa Heath/Zenith store said they were electrically the same, with identical jumpers.

Also, there were several revisions of Heath/Zenith CP/M floating around out there. I had an early H89 machine, the MTR-89 ROM with the CP/M-enable jumper wire, and CP/M version 2.2.03: Could I have stumbled onto some kind of combination that wouldn't work?

To start with, I knew the old MTR-88 monitor ROM was designed to support the cassette port and HDOS, but not CP/M. MTR-89 was intended to run both CP/M and HDOS; but Heath had apparently decided that anybody who could afford a CP/M disk system would not want to run the cassette system, too.

A call to Jim Kandul at KCSS confirmed that his software had been initially developed for the H8; but there were customers successfully running it on H89s. He wasn't sure, though, which monitor ROMs and which versions of CP/M they were using.

After a couple of days of technical phone calls and several more spare boards borrowed from local HUG members, I finally found two boards that would allow me to boot the system. Both were the older, 1979 version with the number "85-2218-1" silk-screened on the component side.

(Another 1979 vintage board was obviously bad; upon close inspection, I found that someone had pried the NE-555 timer chips out of the sockets and "bulb-snatched" them for another project.)

It's still not entirely clear whether the newer 1981 boards are incompatible with my particular combination of ROM, central processor board, and version of CP/M.

Some people have indicated that the source of the problem is conflicting use of port numbers: the newer ROM (MTR-89) gives the cassette board's port number to the soft-sector disk controller. (This is basically the same problem that can occur with some non-Heath boards, as noted above.)

For TapeIO, Jim uses port numbers 370 and 371 octal (F8 and F9 hexadecimal);

your H/Z89 documentation may be able to tell you whether that port number is in use for something else. It should be easy to tell if you have a newer ROM. Just before boot-up, hit the "V" key; if the ROM gives you its version number, it's a newer ROM.

In any event, Jim can give you patching information to take care of a conflict in port assignments.

However, the problem might equally be that there are simply a lot of bad cassette I/O boards out there that haven't been discovered because they've been sitting on a shelf and haven't been used. The technician at the local Heath/Zenith store thinks this is the problem; he's convinced the two layouts are electrically interchangeable.

In any case, make *sure* you have a board that will work with your computer and version of the monitor ROM and CP/M before trying to use the software!

The manual is concise, with clear directions, but there is little information about the hardware.

The question of copies

Once the hardware was working properly, I unpacked and loaded the TapeIO software; it worked fine.

The package consists of the distribution disk, license agreement, and a ten-page manual in a loose-leaf vinyl folder. The KCSS license agreement is worthy of special note. The software is not copy-protected, and the license restricts use to a particular individual, rather than to a specific machine.

This has the advantage that a user can run the programs at home, and then use them on another machine when at work or at school. There is the disadvantage for club or classroom use that, to be proper, the original purchaser of the software must be present to use it, or at least to supervise those who do.

If you find this impractical, you should contact KCSS and inquire about special site-license arrangements. The vendor deserves some assurance that the students or club members won't mass-produce freebie ripoff copies for all their friends the first time the staff member goes out for coffee. Schools, for instance, have a dismal record for software piracy of all kinds—not just computer programs, but films, video tapes, and sheet music as well.

Some information may be scarce

The TapeIO manual is concise, and includes clear directions on using all the utilities. It includes a two-page sample session illustrating how to correctly back up, verify, and restore files; it also has a complete directory of possible error messages and some limited trouble-shooting information.

There is almost no information about the hardware, however, nor any detailed theoretical explanation of how the programs work. Apparently, KCSS assumes the user already has the technical manuals for the cassette board and the Heath TED-8 and B.H. BASIC manuals—and a good deal of experience.

While that is probably true for the first group of customers mentioned earlier, it may not be so for the second group—novices who just want a cheap CP/M backup. They probably have a newer H89A where the manual doesn't even *mention* cassette I/O, and they may be trying to get up and running with a scrounged or borrowed H(A)88-5 board.

The old Heath cassette software is probably worth having, if only for the compression/expansion feature. Of course, any of the existing Huffman-algorithm compression utilities, such as the Heath Users' Group's SQ.COM and USQ.COM, ought to work fine. However, while they conserve space on both the disk file and tape, they also may make data more vulnerable to loss.

Essentially, compression programs squeeze text into a smaller file space by substituting shorter binary combinations for commonly used ASCII characters, such as the letter "e". This is much as is done in Morse and other variable-length digital codes. When reading a straight, uncompressed ASCII file where all characters are known to be the same length, a missed bit normally garbles only one character. In a text file, that is no worse than a normal typo. In a compressed or encrypted file, however, the problem is that a missed bit may garble a much longer string of characters before the translating program becomes re-synchronized; the missed bit can possibly trash as much as an entire block.

The lack of technical information, about both the cassette-board hardware and how the software works with CP/M, puts the more adventurous tape-hacker at a real disadvantage. Suppose you want to try the cassette board in a different slot. If you already have both hard- and soft-sector boards and an RS-232 serial card in the right-hand slots, maybe you will even want to try one of the left-hand slots. If so, you're pretty much on your own.

To be fair, it should be said that even Heathkit, normally impeccable in the quantity and clarity of its documentation, is a bit sketchy on the details of the H88-5. The manual that came with my H89 does include a layout and schematic of the board, and directions for plugging it in and wiring the cables. However, it would be nice to know, for example, the best audio level, in millivolts, on the

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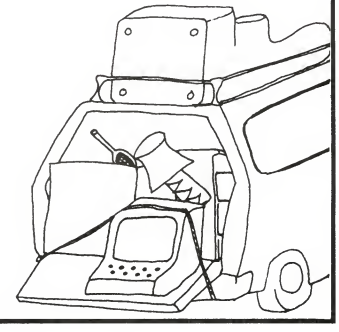

input cable for the optimum signal-to-noise ratio, least number of dropouts, etc. The user has to establish this by trial and error and much fiddling with the volume knob. Too high or too low an audio level, and characters may become garbled, generating spurious CRC checksum or block-sequence errors.

Putting TapeIO to work

As for the TapeIO software, it does everything advertised.

Especially nice is the fact that you not only can back up and restore individual files, but you can use the "*.*" CP/M wild-card convention to specify backing up an entire disk full of files; or you can use wild cards to extract a number of files from a cluttered disk and back them up. This also works on restore, though it can be time-consuming. (There are some special rules for multi-file backup and restore. And no more than 255 files may be backed up in a single pass—generous enough for most applications.)

The first version of TapeIO I received had one disadvantage, namely that the CRC-checking function was always active when using the RESTORE command. This was fine for an executable .COM file, which has to be perfect to run; but it was a nuisance with long text files, where an occasional typo was perfectly acceptable. The convenience of being able to let the machine run unattended for up to an hour or more would have been very desirable.

Fortunately, a newer release of TapeIO, version 1.5-B, has the option of turning off the CRC on restore; this option is included in the operating menu.

There does not appear to be any provision for copying one cassette tape directly to another; if you have the old H88 tape software, though, you can make use of the board's provision for two recorders to do this. Alternatively, the tape can be restored to a CP/M file, and then copied onto a second tape, although this is more time-consuming.

A manual transfer between tape recorders with a patch cord, without using the computer, is perfectly possible. However, some tinkering is necessary to get the right levels. In fact, there is no good reason to restrict this backup system to conventional cassette recorders. Used open-reel tape machines or eight-track cartridge transports are often available very cheaply; they will work fine, so long as the frequency bandwidth is adequate to record the mark and space tones from the I/O board. Avoid surplus voice-only dictation machines, though.

I experimented briefly with backing up CP/M files on the audio track of a six-hour VHS videocassette. This has the theoretical capacity of 1.8 megabytes on a three- or four-dollar tape.

However, I found it rather tricky when I did the experiment with an older-model VHS recorder. This machine puts the audio on both the audio output jack and the TV's FM sound subcarrier, and the sound was stronger on the TV output.

On a machine similar to the one I used, a good low-noise preamp is needed to recover sufficient audio from the video recorder's audio-editing jack. In order to use the TV output, the TV's automatic gain control must be set just right; otherwise, recovering the audio from the TV's FM discriminator is complicated by the presence of video noise. Also, there is the problem of radio-frequency noise from the computer getting into both the video recorder and the TV set.

I was able to make the process work, and restore a long text file from videotape to CP/M disk. However, the noise and error rate was greater than with a regular cassette; unless special filters and preamps are used, older video recorders are probably unusable for long executable COM files.

On a more positive note, the newer VHS machines that come with a hi-fi stereo TV tuner ought to work fine. They are set up to provide six hours of audio at 20 hertz to 20 kilohertz with or without video information. Unfortunately, I haven't had a chance to try one of them yet.

The first basement hacker who comes up with a reliable $99 black box that allows rapid backup on a video tape's *video* track is going to get rich!

Some conclusions

KCSS's TapeIO is a fine package, and performs as advertised. It will particularly be a boon to the hobbyist who has a lot of old Heath cassette files and B.H. BASIC software; it will be well worth the $39.95 in time saved from retyping old programs into the more convenient CP/M disk format.

For the user who just wants economical, simple CP/M file backup on cassette, the cheaper 0.0 version (without the B.H. BASIC translating feature) is an even better bargain at $25.

The documentation is adequate for using the software on a running system. However, additional information on how TapeIO works and on getting the hardware working would have been nice to have. Prospective buyers should make sure the cassette I/O board they have will work with their system before trying to run the software.

Running as an integrated system, TapeIO and a CP/M Heath computer are limited in speed and accuracy by the hardware. Loading and saving files on tape is inherently a lot slower than even a pokey H17 disk, or even the faster and more sophisticated digital cassette systems.

The system works well, however, and is cheap and simple. It will be reliable enough for even a fairly long executable .COM file if you are careful, use decent quality media and equipment, and always verify tape files before storing them. (I loaded and restored a complete 24K BASIC interpreter, and it ran without error.)

Special thanks to: Cliff Kimmery, members of the Al Lynch HUG, and the staff of the Tampa Heath/Zenith store.

Ordering Information

TapeIO version 1.5, $39.95; version 0.0, $25; BASCONV, $25.
Runs under CP/M; specify Heath/Zenith H17 (hard-sector) or H37 (soft-sector) disk format.
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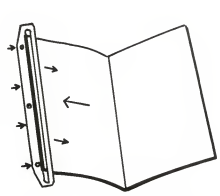

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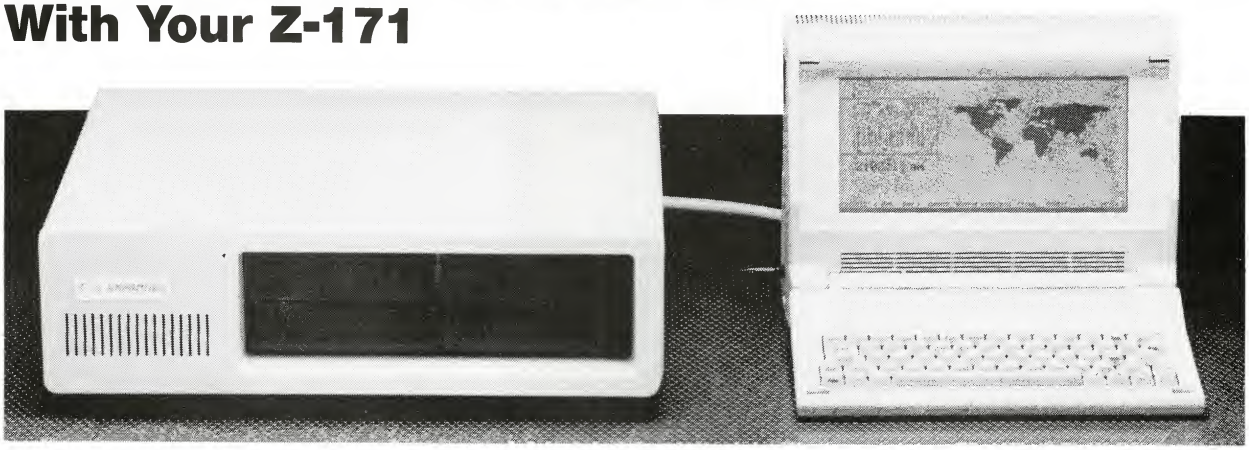

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C Notes

Joseph Katz

RETARD and ARREST your batch files

System unpredictability is part of the price I pay for writing about computer software and hardware. Much of the testing demands that I load a setup program or driver that alters the system in some way. Usually, I do this by means of a batch file containing all the necessary commands. The trouble is that sometimes various elements conflict with one another, depend on the absence or presence of something else (such as the ANSI.SYS driver), or just don't "take."

Once I know what to expect, I like my computer to move faster than possible. During the shakedown periods, however, it's smart to move cautiously. Sometimes I do.

RETARD and ARREST are two tools I've created to help my batch files move cautiously.

RETARD slows down the course of events: it wastes time. Run RETARD with a numeric argument (whole numbers only, please), and it waits that number of seconds before terminating.

ARREST writes a message to the screen, then pauses; at that point, you can abort by means of a CTRL-C or continue things by pressing any other key.

I simply include command lines to call these programs between one stage and another in the batch file; doing so lets me see what's happening as the batch file is processed. Eventually, when I'm sure everything is under control, I can edit the batch files to remove the calls to RETARD and ARREST.

Right now, for example, I'm working out with, among other things, an Apple LaserWriter and a Logitech C7 mouse. It's a lovely combination, but sometimes, since I'm experimenting, I have the serial port (COM1) set up for output to the printer, and at other times I have it set up for input from the mouse. The two setups are incompatible, of course: you can't move the cursor with a printer or print with a mouse.

The trick is remembering which setup is in control at any time. I can't. Not ever. So I write notes to myself in the batch files that do the installation. Wherever a command line in the batch file has made some significant change, following it with a REMark line can send a suitable notice to the screen: "Mouse on COM1" may not win a literary prize, but it surely has saved my blood pressure from soaring because of a futile attempt to print to a mouse.

To make sure I have time to see the note before the screen is cleared or obscured by the next program called by the batch file, all I do is follow the batch file's REM statement with a command line something like

```
RETARD 10
```

Then the message is sure to stay on the screen for ten seconds before the next program is run.

RETARD is easy. (See Listing 1.) It uses the Unix time( ) function, which is present in the libraries of most standard C compilers and should work the same way in all of them. It simply reads the system time in seconds.

(Here we must retard our current progress for a moment to recall that the integer returned by time( ) is always a long—never an int, a short, or a float. You will get into one kind of trouble or another if you forget this.)

With time( ) on our hands, all that RETARD.C need do is read the desired delay from the command line when the program is run, get the system time, and begin some sneaky calculating.

I begin by setting the actual "start" of the program to the system time at the moment the program read it. Immediately RETARD assigns that time to the hypothetical "stop" of the program. Then a while loop is established: it checks the current system time, reassigns the "stop" to it, and subtracts the "start" from that "stop" until the difference is equal to the specified delay. At equivalence, RETARD terminates and the batch file goes on to execute the next program in line.

So that you can get a better idea of what goes on internally, I've included debugging statements in the source code to display some relevant values. You really ought to include the debugging statements when you compile RETARD, and run the program once or twice until you're sure the time( ) function in your compiler's library works as required. If the reported SECONDS isn't the same as the delay you specified on the command line, something's wrong.

Once you're sure the program works correctly, recompile with DEBUG undefined; that is, either delete that line or comment it out with /* and */. Commenting-out is better because the compiler will ignore the debugging statements, and you can retain the line in your source code should you need to study the program again.

(In case you are wondering, I rarely use debugging statements: most of my code works absolutely right the very first time. And if you believe that, please let

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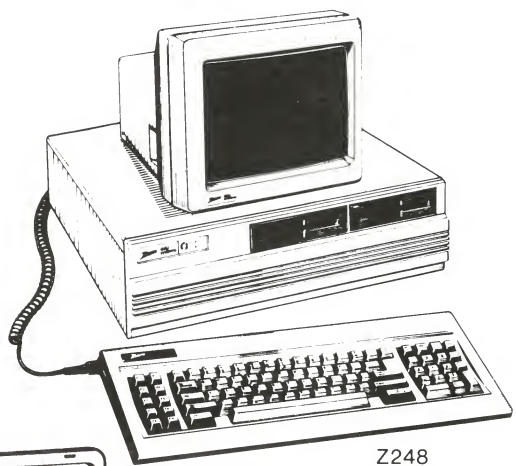

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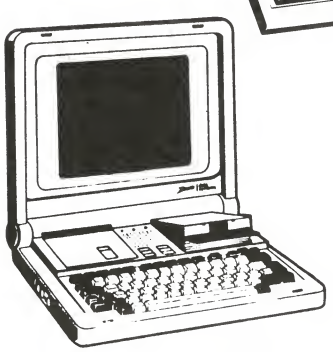

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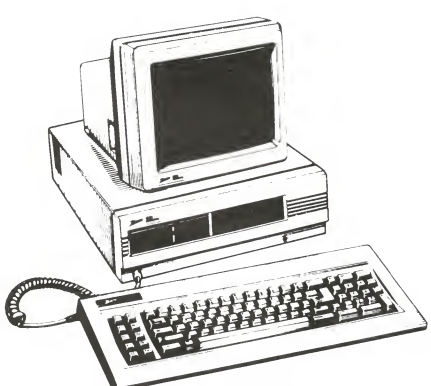

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me know when you are available for poker.)

Although RETARD is a simple program, ARREST is simpler still. It, too, reads the command line for arguments when the program is run. If only the program name is supplied at execution, ARREST supplies a default prompt and waits for a keypress.

You're right—doing it that way makes ARREST behave like PAUSE, the batch command integral to the Microsoft Disk Operating System (MS-DOS). The only difference in behavior is that the PAUSE prompt is bland and incomplete:

Strike a key when ready . . .

Vendors who provide batch files to install their software often write additional lines to explain matters better, as for example:

Press CTRL-C to quit or--

But there's frequently quite a gap between the two prompts, and the combination usually looks odd.

Where ARREST leaves PAUSE in the dust is in its ability to accept command-line arguments; these become the prompt when the program is executed. In a batch file, then, the command

ARREST What are you waiting for?

will pause the batch process to display the prompt

What are you waiting for?

The batch file will then wait for you to enter CTRL-C to abort, or for any other keypress to resume. You can use ARREST over and again in the same batch file with different command-line arguments that produce different prompts, and either dazzle users with your versatility or illuminate them with your sensible guidance.

If you like some other prompt better than mine, you can revise ARREST for any default prompt (of reasonable length), and it needn't be exclusively in the English language.

ARREST.C is given in Listing 2. The way I've written it lets the program take any number of command-line arguments. If just the program name has been supplied at execution, the argument count will be 1. (Using C, you can treat the program name as an argument; think of it as the zero'th argument.)

You'll notice that the for( ) loop starts with argument 1 and continues reading arguments until one less than the argument count, so you can supply arguments to ARREST for as long as your fingers hold out.

(If it seems as though I've ignored the last argument, again remember that the program name is an argument. An understanding of argc and argv helps; I'll try to demystify that subject in a future "C Notes." Until then, have faith.)

The actual pause comes while the getch( ) function waits for keyboard input. getch( ) is present under that name in the latest versions of the C function libraries from both Microsoft and Computer Innovations. It's really one of MS-

```
/*  ** RETARD.C -- waits # seconds before terminating  ** **
Copr. (C), 1986, 1987, by Joseph  Katz  ** 1.00, 4 Jan 86 **
*/

#include <stdio.h>

#define DEBUG

int seconds;

main(argc,argv) int argc; char *argv[]; { if(argc == 1)
        seconds = 5; else
        seconds = atoi(argv[1]); pause(seconds); exit(0); }
        /* end main */

pause(seconds) {
    long start, stop;
    time(&start);
    stop = start;
    while ((stop - start) < seconds)
        time(&stop);

#ifdef DEBUG
        printf("START = %ld\n",start);
        printf("STOP  = %ld\n",stop);
        printf("SECONDS = %d\n",seconds); #endif

}       /* end pause */
/* end RETARD.C */
```

Listing 1. RETARD.C. Incorporating a RETARD <N> call in a batch file will delay the file's execution for N seconds at the point of the call. This gives you time to check the progress of the batch file as it is executed.

```
/*  ** ARREST.C -- prompt for keypress and wait **  ** Copr.
(C), 1986, 1987, by Joseph Katz ** 1.00, 4 Jan 86 ***/

#include <stdio.h>

main(argc,argv) int argc; char *argv[]; { int i;
             /* counter for loop */ if(argc == 1)    /* no
arguments gets default prompt */
        printf("CTRL-C  exits, any other key continues:  ");
else {
        for  (i = 1; i <= argc - 1; i++) /* skip the program
name */
        printf("%s ",argv[i]);
        } getch();       /* wait for key or CTL-C */
exit(0); }
    /* main ends */ /* end ARREST.C */
```

Listing 2. ARREST.C was written for compilation under the Microsoft C compiler. Called from a batch file, ARREST will halt the file's execution at the point of the call, and wait for you to enter either CTRL-C to abort, or any other key to continue execution of the batch file. (The actual pause comes while getch( ) waits for keyboard input. You may also be able to compile the listing under the Computer Innovations C compiler, since it also contains the getch( ) function.) Calling ARREST <STRING> in a batch file displays <STRING> as a screen prompt.

Listing 3. NUMBER.C will copy a text file, inserting line numbers. To determine the layout of the lines, you can use the values given here, or change them to your own values for margin, line_number, fence, gutter, and leader.

```
/* ** NUMBER.C --  numbers  text  lines  sequentially **  **
Copyright (C), 1986, 1987, by  Joseph Katz ** New Series (1)
1.00, 21 Feb 86 */

#include <stdio.h>

int  margin = 5;                /*  left  edge  of  page   to
                                numbers */
int  line_number = 1;           /* line number to output */
char fence = ':';               /* fence character */
                                                          →
```

```
int  gutter = 5;                /* gutter width */
char leader[] = "     ";        /* gutter separator */
char input_line[256];           /* max width of input line */

int c;                          /* input bytes */
int  inname, outname;           /* to check dup filenames */

FILE *input, *output, *fopen();

banner() {
    printf("NUMBER -- numbers lines of a text file\n");
    printf("Version NS 1.ØØ\n");
    printf("Copyright (C), 1986, 1987, by JOSEPH KATZ\n\n");
}

main(argc,argv)                 /*  accept command-line  args
                                */
int argc;                       /* count args */
char *argv[];                   /* array of ptrs to args */
{
    banner();
    /* progressive error trapping section */
    /* check for correct number of arguments */
    if(argc < 3) {
        puts("Specify input and output filenames.");
        exit(1);                /* error exit */
    }


    /* check for same name used as input and output */
    inname = strupr(argv[1]);   /* uppercase input name */
    outname = strupr(argv[2]);  /* uppercase output name */
    if(strcmp(inname, outname) == NULL)  {  /*  NULL  if the
same */
        puts("Make input and output names different.\n");
        exit(1);                /* error exit */
    }

    /* check for existing file with same name as output */
    if(fopen(argv[2],"r") != NULL) {
        printf("Overwrite  existing  file  with same name as
output (Y/N)?  ");
        if(toupper(getchar()) !=  'Y') {  /* 'Y' or 'y' only
*/
            puts("Aborted by user.");
            exit(1);            /* error exit */
        }
    }

    /* open input if it exists */
    input=fopen(argv[1],"r");   /* open input */
    if(input==NULL) {           /* no such file */
        printf("Can't find the input file.\n");
        exit(1);                /* error exit */
    }

    /* open output and check for full disk or directory */
    output=fopen(argv[2],"w"); /* open output */
    if(output==NULL) {          /* disk or directory full */
        printf("Can't make the output file.\n");
        fclose(input);          /* guarantees the close */
        exit(1);                /* error exit */
    }

    /* flow control and transformation section */
    printf("Numbering lines now . . .");

    while(fgets(input_line,256,input)) { /* flow control */
        /*  asterisk in  conversion  modifier  signifies  an
argument */
        fprintf(output,"%*d%c%*s%s",margin,++line_number,
                        fence,gutter,leader,input_line);
    }

    /* termination section */
    fclose(input);              /* close files */
    fclose(output);
    exit(Ø);                    /* normal exit */

}   /* end main() */
/* end NUMBER.C */
```

DOS's standard requests for system services, called by interrupt 21 hexadecimal; in this case, it's function 8h (read keyboard, no echo—which does console input with no echo but checks for CTRL-C). So, if you can't find or don't like the library function, you can substitute bdos(8) & 0xFF (or the equivalent for your compiler) in place of the getch( ) function.

NUMBER your text lines

Among the reasons why I enjoyed Anthony Herbst's "A C Utility that Does More than PRINT" (*Sextant* #25, November-December 1986) is that the need to number lines in text files was one of the things that got me into my present mess.

Some years ago, my wife Janet and I were on the public-relations committee of a charitable organization, and someone volunteered me to write scripts for television and radio public-service announcements. The fastest way to discuss documents of any kind in a committee is if everyone has a copy of the script and all the lines are numbered. PIP, CP/M's "Peripheral Interchange Program," could number lines—but not the way I needed them numbered. PIP uses the colon as the "fence"—the character that separates the numbers from the lines. For some reason or other that I can't recall now, I needed a different fence character.

At any rate, line numbering (along with a growing stack of other such nuisance jobs) was what got me to mucking around with programming in C. I should tell you that I haven't yet finished with the program. Like Topsy, it has growed. I moved the source code from one CP/M computer to another, then to my Z100, and a few years ago to my IBM compatibles.

The latest incarnation of my numbering program is by now a good example of a simple program that suffers from rampant featuritis: depending on what I specify, it will or will not skip blank lines, will start numbering with 1 or any other number, will begin a new sequence of numbers or not on fresh pages, will allow runtime variations of the fence and all other defaults, and will prompt me for file names if I forget to specify them in the command line that calls the program.

I have a few more things I'd like to add to NUMBER, and I suppose I'll continue to add features until the program becomes absolutely unusable, but I still have affection for the early version that did nothing much except number lines consecutively starting with 1.

To vary the title of Mr. Herbst's article slightly but appropriately, NUMBER is a C utility that does *less* than PRINT. It's a simple filter that copies an input file to an output file while numbering the lines to the output file.

NUMBER.C is given in Listing 3. When you look at it, you'll recognize that much of it is the filter skeleton I introduced

early in this column's history with the promise I'd be reusing it forever. I'm keeping that promise.

The chief difference here from earlier incarnations of the filter skeleton is in NUMBER's use of fgets( ) instead of getc( ). getc( ) reads one byte at a time from the input. That's nice when you want to convert individual bytes, but that's not what I want to do here. Instead of working with each *byte* as a unit, I want to work with each *line* as a unit. For that I need "buffered I/O," of the kind fgets( ) does: it reads a specified number of bytes from a file into a string.

What I do is assume that if an input file exists it will have at least one line. (A reasonable assumption, you'll agree). So, I preface the first line with that number, read the line from input, format the line as I want it to look, and write it to output.

NUMBER always anticipates the existence of more input in its numeration, staying one number ahead of reality. That's okay because, when fgets( ) encounters the end of the input file, NUMBER closes shop anyway, and the last number never gets used.

Just as interesting is that NUMBER uses fprintf( ) instead of fputc. fputc( ) writes a byte at a time to output, which won't do here unless I want to play games with the individual atoms of the line read from input by fgets( ). I most certainly don't want to do that here. fprintf( ) allows me to format the line when it's output, which I most certainly do want to do. It's in the formatting that I add the number and other stuff that dresses up the line.

In Listing 3, look at the program header, in which I've declared the formatting conversions. They determine the physical layout of the resulting line, moving from left to right as it will appear on the page:

margin—the white space at the left-hand edge of the page;

line_number—numeration starts with this integer;

fence—the character following the line number;

gutter—the space between the fence and the beginning of the line; and

leader—the character used to fill the gutter space.

The default margin is five characters; if you change it, remember that this margin is in addition to any page offset a word processing program such as WordStar normally introduces.

The default line_number is 1; if you want to begin with a higher number, check your compiler for the largest positive number it allows for an int. You probably won't have problems unless you're numbering the lines of a book or monograph. (If that's what you intend to do, though, be aware of the "rollover point"—when you start getting negative numbers or garbage from an int.)

The default fence is a colon; you may change it to any printable character. The default gutter is 5; you may change it to any reasonable number that puts the amount of space you want between the fence and the beginning of the line.

The default leader is five spaces; you may change it to any set of printable characters you want, as long as you have allowed space for them in the gutter. (With a gutter of 5, you may use up to five characters in the leader. If you want to use six characters in the leader, change the gutter to 6.)

The default input_line is 256 bytes; you may change it to any length, but I wouldn't recommend it. fprintf( ) requires you to declare the number of characters to be read, so you need some number here. I've used one that likely won't be exceeded by any line in any text file any of us will ever produce. It's also calculated for reasonable efficiency in the way MS-DOS allocates buffer space. Why not just leave well enough alone?

You probably won't, though, because if you're anything like me you'll find this program addictive. There's pure fun in fiddling around with the ways it works, the ways it can be made to work better, and the ways it can be made to do more things. I feel a little guilty about dangling this irresistible bait in front of you, but I suppose that feeling will pass soon. Have fun.

SPIN your disks faster

In "Faster Disk Access for Heath/Zenith MS-DOS" (*REMark*, August 1986), Pat Swayne pointed out two memory locations having information that affects floppy-disk input/output (I/O) of the '150- and '200-series computers. Those two locations control the "head-settle" and "motor-on" delays introduced to compensate for access on slow floppy-disk drives.

(The head-settle delay allows time for the drive's head to bounce during loading. The motor-on delay allows time for the drive's motor to reach proper speed before an attempt is made to read the disk.)

Pat determined that these delays were overly conservative or entirely unnecessary for many of the floppy-disk drives supplied with Heath/Zenith computers. He therefore devised a couple of assembly language programs to reduce the delays. Both programs patch floppy disks. One (MAKFST) alters the boot record on existing system disks. The other (FASTFORM) writes a non-standard track image on disks being newly formatted.

Within a few weeks after Pat's article appeared, Rick Housh contributed to CompuServe's HUG Special Interest Group (GO PCS48) a Turbo Pascal program that took a different approach. It patched the delays directly in memory. Rick's DSKSPED has the advantage of being just one program instead of two, as well as having two improvements.

Because DSKSPED does nothing to the floppy disks, they can be used confidently in drives and on computers that may require the delays. And because the

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patches are to RAM, they work their changes immediately and can be changed themselves just as fast. You therefore can experiment by setting different values for the two delays, and find just the right combination for your system.

I couldn't resist the temptation to try this same thing in C, partly because I wanted a small example to use here for developing two points mentioned briefly in connection with last issue's SWAPLPT and SWAPCOM. (See "C Notes" in Sextant #27, March-April 1987.) Partly, also, Housh's DSKSPED.COM looked too fat at 12 kilobytes.

(There are a great many Turbo Pascal programmers around, many of whom are probably in much better physical condition than I am; so I have absolutely no intention of getting into a dispute over which programming language is "better." I'm a peaceful person anyway. In case you're spoiling for a fight with one of those guys, though, you might be interested in my impression that Turbo Pascal tends to produce programs of greater size than their C equivalents.)

So I wrote SPIN, my redaction of Housh's approach. (See Listing 4.) SPIN.C is a loader for assembly language functions. In that respect, it's similar to SWAPLPT.C and SWAPCOM.C (the programs in last issue's "C Notes" that loaded functions in that same issue's SWAPS.ASM). In other respects, it's slightly more ambitious. I'll get to the slight ambitions in a moment.

You'll recall that I wanted SPIN as a way to exemplify two points. One point concerns varieties of the PTR operator in 8086 assembly language—used last issue in the SWAPS.ASM library for SWAPLPT.C and SWAPCOM.C. There are five possible types of PTR; which one is used depends on the memory operand's size: BYTE PTR points at a single byte; WORD PTR (used in SWAPS.ASM) points at a pair of bytes; DWORD PTR points at a pair of words; QWORD PTR points at two pairs of words; and TBYTE PTR points at five pairs of words. (All bytes and words associated with a single pointer must be contiguous.)

BYTE PTR and WORD PTR are the forms I most often require in memory-addressing functions. (I tend to be easier on the *machine's* memory than I am on yours.) So, since we've already looked at the use of WORD PTR, it seems appropriate to look at BYTE PTR. You can see it used several times in SPINSTUF.ASM (Listing 5), source code for the assembly language functions loaded by SPIN.C.

The other point I wanted to develop here is that patch functions like these are extremely simple to write (so simple that no one wants to admit it) when you know the addresses to patch and the values you want to put at those addresses. In contrast, the functions in SWAPS.ASM last issue know the addresses but not their contents, and so were relatively harder to

```
/*  ** SPIN.C --  adjusts floppy head settle/motor on delays
** ** Copr. (C), 1986, 1987, by Joseph Katz ** 1.ØØ,  1Ø Oct
86 ** ** Note: ONLY for MS-DOS.  */

#include <stdio.h>

#define MACHINE "H/Z-241"

banner() {
    printf("SPIN for the %s\n",MACHINE);
    printf("Copyright (C), 1987, by Joseph Katz");
    printf("Sets efficient floppy disk access.\n");
    printf("Usage: spin [speed]\n");
    printf("[speed] can be Fast, Medium, or Normal.\n");
    printf("Defaults to Normal.\n\n"); }
        /* end banner */


main(argc,argv) int argc; char *argv[]; {
    if( (*argv[1] == 'f') || (*argv[1] == 'F') ) {
        banner();
        fdr_fast();
        printf("Floppy access set to FAST\n");
        exit(Ø);
    }
    if( (*argv[1] == 'm') || (*argv[1] == 'M') ) {
        banner();
        fdr_med();
        printf("Floppy access set to MEDIUM\n");
        exit(Ø);
    }
    if( (*argv[1] == 'n') || (*argv[1] == 'N') || (argc < 2)
)
    {
        banner();
        fdr_norm();
        printf("Floppy access set to NORMAL.\n");
        exit(Ø);
    }
    else {
        banner();
        printf("Bad speed: try Fast, Medium, or Normal.\n");
        exit(Ø);
    } } /* end main */
/* end SPIN.C */
```

Listing 4. SPIN.C is intended for the '150 and Heath/Zenith's other IBM compatibles. It loads into memory the head-settle and motor-on delays set by the assembly language routines in SPINSTUF.ASM. (See Listing 5.)

Listing 5. SPINSTUF.ASM is written for Microsoft's MS-DOS assembler (MASM) on the '150 and Heath/Zenith's other IBM compatibles. SPINSTUF contains routines to establish the head-settle and motor-on delay times for the disk drive. The resulting values will be loaded into memory by SPIN.C (Listing 4). SPIN's values for "fast," "medium," and "normal" times are those the author has found suitable for his computers. You can experiment to find the best values for your computer.

```
; SPINSTUF.ASM
; Some routines for mucking around with floppy disk vectors.
; Tested on Heath/Zenith's MS-DOS computers and the IBM PX-XT
; with MS-DOS 2.1 and 3.1.  Untested but may work with IBM-
; compatibles generally.
;
; By Joseph Katz for publication in his "C Notes" column in
; SEXTANT
; 1.ØØ
; Based on ideas from Pat Swayne and Rick Housh.
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
; PROLOGUE FOR MICROSOFT C 4.Ø SMALL MODEL

ASSUME CS:_TEXT _TEXT
        SEGMENT PUBLIC BYTE 'CODE'

; PROLOGUE ENDS
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; FLOPPY DISK  ACCESS  ROUTINES
;
; These three routines change memory  locations that control
; the head settle time and  motor  delay
                                                              →
```

```
;
;  Two  locations need  patching:
;       0000:0579 head settle
;       0000:057A motor wait
;  Mix and match as your system requires.

;
; for FAST access  --  values  of  00,00  work  on  all my machines
;
        PUBLIC  _FDR_FAST
_FDR_FAST PROC  NEAR
        PUSH    BP
        MOV     BP,SP
;
; SET SEGMENT
        PUSH    ES                      ; SAVE ES
        MOV     AX,0000H                ; SEGMENT
        MOV     ES,AX
; CHANGE BYTES AT APPROPRIATE OFFSETS
        MOV     BYTE PTR ES:[0579H],00  ; HEAD SETTLE TIME
        MOV     BYTE PTR ES:[057AH],00  ; MOTOR WAIT TIME
        POP     ES                      ; RESTORE ES
;
        POP     BP
        RET
        _FDR_FAST ENDP
;
;


;
; for MEDIUM access -- values of 00,02 I suppose
;
        PUBLIC  _FDR_MED
_FDR_MED PROC   NEAR
        PUSH    BP
        MOV     BP,SP
;
; SET SEGMENT
        PUSH    ES                      ; SAVE ES
        MOV     AX,0000H                ; SEGMENT
        MOV     ES,AX
; CHANGE BYTES AT APPROPRIATE OFFSETS
        MOV     BYTE PTR ES:[0579H],00  ; HEAD SETTLE TIME
        MOV     BYTE PTR ES:[057AH],02H ; MOTOR WAIT TIME
        POP     ES                      ; RESTORE ES
;
        POP     BP
        RET
_FDR_MED ENDP

;
; for NORMAL access -- values of 0F,08 are from H/Z
;
        PUBLIC _FDR_NORM
_FDR_NORM PROC  NEAR
        PUSH    BP
        MOV     BP,SP
;
; SET SEGMENT
        PUSH    ES                      ; SAVE ES
        MOV     AX,0000H                ; SEGMENT
        MOV     ES,AX
; CHANGE BYTES AT APPROPRIATE OFFSETS
        MOV     BYTE PTR ES:[0579H],0FH ; HEAD SETTLE TIME
        MOV     BYTE PTR ES:[057AH],08H ; MOTOR WAIT TIME
        POP     ES                      ; RESTORE ES
;
        POP     BP                      ; RESTORE BP
        RET
_FDR_NORM ENDP
;
;  FLOPPY  DISK ACCESS ROUTINES END
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
; EPILOGUE FOR MICROSOFT C 4.0 SMALL MODEL
;

_TEXT           ENDS
                END

;
; EPILOGUE ENDS
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
```

write. They have to read one address and swap its contents into another.

What SPINSTUF.ASM does, however, is simply to slap hardcoded values into hardcoded addresses; we know the significance of those addresses, and their original contents really do not concern us. You can use these same techniques in other situations. They're adaptable.

So's SPIN. You'll notice you can run my program with one of three arguments:

SPIN FAST

produces no delays, which is just fine for my H241 with its Mitsubishi 1.2-megabyte drive A: and its Shugart 360K drive B:. Lever-latched, their heads are always loaded and therefore need no delay to compensate for a loading bounce.

SPIN MODERATELY

therefore has no head-settle delay either, but it does provide a slight motor-on delay (about a quarter of a second) in case there's a need.

SPIN NORMALLY

patches in a head-settle delay of about one second, and a motor-on delay of about half a second. These are standard in Heath/Zenith MS-DOS for IBM compatibles. If you run SPIN with no arguments, it defaults to these normal values.

Listing 5 includes the delay values that I use. You can experiment with your own values on your own computer. For what it's worth, I've roamed the South trying SPIN on a variety of machines, and the values that work on my H241 have worked on them all. I've been unscientific in my testing, though, so I warrant nothing in no way and nowhere to no one.

(You may have installed Software Wizardry's Wildfire speed-up module on your '150. Both Pat Swayne and the Wildfire documentation note the possibility of conflict between their approaches. For example, with Wildfire installed you won't be able to access disks modified by Pat's programs. I doubt that SPIN will create any problems for Wildfire or other speed-up packages. If problems do arise, though, it's always best to go back to normal delay values before blaming things on the speed-up package. Here again, you can experiment in order to find the best delay values for your computer.)

Instead of reassembling and linking SPIN for each test, you may want to use DEBUG to change the values. If so, you'll have to rename the program to remove the .EXE extension before loading it into DEBUG; then rename it back to SPIN.EXE after exiting DEBUG. DEBUG won't handle .EXE files.

In DEBUG, patch locations 0000:0579 (for the head-settle delay) and 0000:057A (for the motor-on delay). Use DEBUG's E command, and make sure to use the hexadecimal radix for values. Once you decide on those that work best for your system, you can hardcode them into the functions in SPINSTUF.ASM.

Ah, yes, the size. Mine's smaller! SPIN.EXE is around 6K when compiled by

version 4 of Microsoft C, about half the size of Rick's Turbo Pascal version.

Plumbing the depths of the '150

DEBUG is all right for peeking and poking into RAM. And, since it comes with Heath/Zenith MS-DOS, it has the distinct advantage of requiring no extra cash outlay. However, it's pretty spartan, because it operates in one display mode at a time, takes over the computer when you run it, and gives you no way to recover from tinkering that goes a little awry.

If you do much tinkering of the kind I've been suggesting here, you'll soon want a more powerful tool—such as Soft Advances' DSD86 or Morgan Computing's Advanced Trace 86. The latter has the capability for RAM-resident operation; this is particularly useful for patching "on the fly." While you are in the process of tinkering, you can move back and forth between patching and watching the patch's effects.

You can do the same thing if you have John F. Ferguson II's XRAY and use it in conjunction with DEBUG. XRAY.COM is a wonderful terminate-and-stay-resident (TSR) program; it pops into action when you press the ALT and left SHIFT keys simultaneously.

The action is that it gives you a live display of what is happening in the area of RAM you specify: DEBUG gives you a snapshot; XRAY shows you a fluoroscope. Press the ALT and left SHIFT keys again and you can view any other area of RAM, put XRAY to sleep again, or kill it altogether.

The only eccentricities I've found with XRAY so far are that some programs (such as NewWord version 3 and XyWrite version 3) interfere with it, and it interferes with some programs (such as Edix). I haven't come across enough such conflicts to bother about; those I have run across can be worked around by simply turning XRAY on or off before turning those programs on or off.

XRAY is priced at a modest $20. And since it's shareware, you can try it in the privacy of your own home before making even that slight commitment.

Ecosoft's C tutor

When I'm asked to recommend a good MS-DOS compiler package for learning C, I go through the index cards in my head and invariably suggest Ecosoft's Eco-C88. Release 3 is a marvel—and fun to use with Ecosoft's editor (CED), available with the package.

Building from that fine base is a growing stack of good C books by Jack Purdum, Tim Leslie, Alan Stegemoller, and the rest of the crew at Ecosoft. Published by Que Books (7999 Knue Road, Indianapolis, IN 46250; 800/428-5331) and more-or-less keyed to the Eco-C88 compiler, they start from the level of that marvelous question a few people have asked me ("How do you spell C?"), and go as high as you might want.

All that has been needed to solidify the structure is a good interactive tutorial on disk. It's here. I've seen a few beta test versions, and by the time you read this, the product itself should be out.

I don't think either the tutorial's title or price have been fixed yet. Not to worry: the target price mentioned to me is so small as to be inconsequential.

Ordering Information

XRAY (version 1), $20.
John F. Ferguson II
6108 Earnshaw
Shawnee, KS 66216

DSD86, $69.95.
Soft Advances
P.O. Box 49413
Austin, TX 78765
512/478-4763

Advanced Trace 86, $175.
Morgan Computing Company, Inc.
P.O. Box 112730
Carrollton, TX 75011
214/245-4763

Eco-C88 C Compiler, $59.95; CED editor, $29.95.
Ecosoft, Inc.
6413 North College Avenue
Indianapolis, IN 46220
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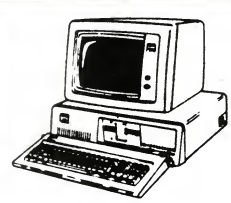

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Assemble a New Memory Disk for Your '100

How to get a larger RAM disk for your H/Z100. A case study in getting from source code to executable software.

John J. Batbie, Jr.

I had just finished souping up my shiny, new, two-drive, eight-color, 768-kilobyte Z100. Now I was running with version 2 of the Microsoft Disk Operating System (MS-DOS), and I was out on the road for a test drive. The Z100 ran super, but slowed significantly on the Disk Drive Access Route.

Let's face it, no matter how fast the computer can go, it has to slow down to a snail's pace when it reads from or writes to a disk. Any program that goes back and forth to disk a lot will make you feel as though you're bumping down some country road.

I wanted to go faster, and after some study I found a way to bypass the access route completely by using the memory-disk (MDISK) drive provided with MS-DOS Version 2.

In fact, a primary reason that I wanted MS-DOS Version 2 was to use its MDISK capability: this allows an area of memory to masquerade as a disk drive. To the operating system and my programs, it would look like an ordinary drive; but reading from and writing to that drive would be a lot faster than using its mechanical equivalent.

Using this drive was easy and gave me an extra 64 kilobytes of memory speed.

This extra memory speed was great, but I felt my machine was capable of doing more. This feeling became a reality when I discovered that MS-DOS Version 2 had improved the MDISK drive to allow as much as 640K memory speed—if I could only find the way to that new drive.

Use of the old MDISK drive was simple. It was already assembled, linked, and ready to run as MDISK.DVD on Disk 2 of the standard MS-DOS Version 2 package.

You, too, may want to soup up your Z100 using the improved MDISK drive.

All I had to do was include a suitable line (DEVICE = MDISK.DVD) in my CONFIG.SYS file. To keep things simple, no parameters were needed: 64K was the only size memory disk I could get.

Several of my friends were aware that MS-DOS Version 2 had the memory-drive capability, but they understood that a single drive was limited to 64K; you could create a number of them, but a 64K block was as large as you could go. They were of the opinion that these 64K blocks could be expanded "if you could find the right parameter in the machine code to change."

I discovered they were both right and wrong. The memory disk *is* limited to 64K blocks if you are using the *executable* version of MDISK provided with the MS-DOS Version 2 distribution disks.

But the capability to get more than 64K is not accomplished by changing a machine-code parameter; rather, there's a newer version of MDISK available.

With the newer version, the size of the memory to be allocated for the memory disk can be specified in a command line in your CONFIG.SYS file. (See below.)

The problem in getting the new MDISK is that you'll need the MS-DOS Version 2 Programmer's Utility Pack. The newer version of MDISK is provided as assembly-language *source code* (MDISK.ASM) on the PUP's Utilities Disk. Therefore, you will have to assemble and link the updated MDISK.ASM in order to produce an executable version.

To make things a bit more complicated, the improved MDISK was not documented in the manuals. My initial efforts to use it were leading to dead ends.

It took nearly two days of wandering about trying to find a way to use the improved MDISK drive before I was finally speeding along using it. (In addition, I had to "discover" how to use the SIZE parameter with the improved MDISK.)

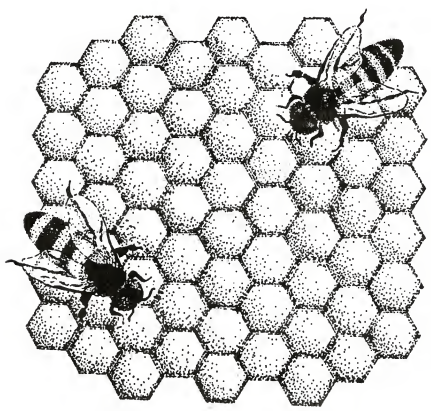
You, too, may want to soup up your Z100 using the improved MDISK drive without running into a dead end. The route I used and the information I learned from my experience is presented in this article.

Even if you already have the new MDISK

Parenthetically, it does not seem to be too uncommon for there to be two versions of a program available at the same time—where the upgraded version is provided only as an .ASM file, while the executable form is still the older one.

Lieutenant Colonel John Batbie, Jr., is an Air Reserve Technician in the U.S. Air Force Reserve, and is one class away from earning his master's degree in business administration.

Beyond IBM PC Compatibility:



Z-100 users who are ready for PC compatibility, should keep one thing in mind. The future. New, state-of-the-art PC software is creating ever greater performance demands on computer hardware. Large scale, memory intensive programs for networking, graphics, number crunching and communications are quickly becoming the rule, not the exception. But software is only as good as the system that runs it.

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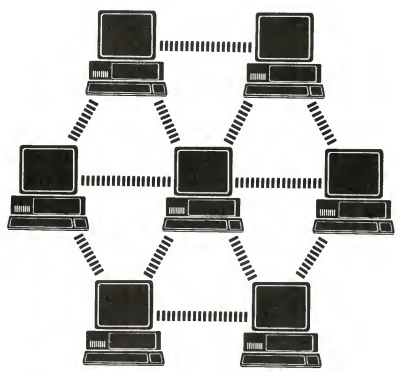

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In this case, a directory listing showed that the old version (MDISK.DVD) had a date of April 4, 1984; MDISK.ASM was dated July 17, 1984. Those of you who purchased MS-DOS Version 2 after I did may very well have the newer version (the one included in the PUP) in executable form.

Even so, beginning computer users may still want to follow along to get a taste of assembling a program from source code. *Writing* assembly language programs may be challenging; *assembling* them is quite straightforward—and knowing how can let you use programs that you might otherwise pass by.

True, in order to get the assembler, you're going to have to buy the Programmer's Utility Pack; but many of you may find that advisable in any event. (If you've been using the '100 since the era of MS-DOS Version 1, you can get an assembler from your Z-DOS distribution disks.)

It's not that hard

On page 1.1, the manual for the MS-DOS Version 2 Programmer's Utility Pack warns that "This manual assumes an advanced working knowledge of assembly language programming." Since I have only a working knowledge, it took me two days to figure out the steps necessary to utilize the improved MDISK.

Unfortunately, the improved MDISK is not mentioned at all in the PUP manual. It's up to the user to figure out the steps necessary to assemble MDISK, and it's up to the user to find out which support files to use in the process.

Similarly, there is no coverage of how to use the improved MDISK once you have finished the assembly/linking process. Those without any knowledge of programming may never be able to utilize this driver without help.

Is it really necessary to make it so difficult? I think you'll agree it is not! For this reason, I'm covering the steps that I followed to assemble and use the improved MDISK.

The two MDISKs

MDISK.DVD is the routine—the device driver—that interfaces MS-DOS to system memory in such a way that part of the memory may be used as an equivalent to disk storage. The advantage of using this driver is that access to the data stored on MDISK is at memory speed as opposed to disk speed. For those programs that are disk intensive, there are significant time savings associated with using the MDISK.DVD driver—as well as reduced wear and tear on your disk drives.

(See pages 9.19 through 9.24 of your MS-DOS Version 2 manual and pages 5.32 through 5.33 of the Programmer's Utility Pack manual for a further discussion of MDISK.DVD and invoking it in the CONFIG.SYS file.)

As indicated above, there are two versions of MDISK.DVD available to you. The first is the executable version provided on Distribution Disk II that comes with MS-DOS Version 2. The second is provided as source code (MDISK.ASM); this one is on the PUP's Utilities Disk. The executable version on Disk II will block out only a 64K portion of RAM for a single memory disk. If you need memory-disk blocks of more than 64K, then you will need the version included on the Utilities Disk. With this version, the range available to a single memory drive is from 32K to 511K on a 768K machine.

(The comments in the MDISK.ASM file indicate that the range for the improved MDISK is from 32K to 640K. However, it has been my own experience that the maximum amount is less than 640K. This is discussed below.)

When using this driver, access to the data stored on MDISK is at memory speed, not disk speed.

Before it is usable, however, the source code must be processed through the Macro Assembler and the Linker. To do this, I suggest you follow the procedure given below.

(In the instructions below, my drive specifications assume that you have a standard two-drive system. If you have a hard-disk system, you will probably want to substitute the E: drive for my use of the A: drive. My references to the B: drive can be changed to your A: drive. And you may have to include the appropriate directory path to necessary programs that are contained in subdirectories other than the root directory.)

Get the files you need

1. At the A> prompt, FORMAT a blank disk in drive B: using the command:
FORMAT B:/S <RETURN>

This will place the operating system on the blank disk, giving you a bootable disk. Place this disk in drive A: after formatting.

2. Place the Z100 BIOS Sources Disk in drive B:. (As always, the distribution disks are used *only* to make copies from.) Now, use the following COPY commands:
COPY B:PARMS.ASM A: <RETURN>
COPY B:MACLIB.ASM A: <RETURN>
COPY B:DEFASCII.ASM A: <RETURN>
COPY B:DEFMS.ASM A: <RETURN>
COPY B:DEFDEV.ASM A: <RETURN>

This will copy onto drive A: the standard MS-DOS support files that will be necessary for assembling MDISK.

If you have ample disk space, you might want to keep *all* the BIOS source files together in the same hard-disk partition or drive, along with MASM, LINK, etc. Then, any time you assemble a program, they'll be there. The ones that are actually needed to assemble a program, however, will be noted towards the beginning of the source code: look for the INCLUDE lines. The files named there are the ones that actually need to be on the default drive with MASM.

3. Place the PUP's MS-DOS Utilities Disk in drive B: and COPY MDISK.ASM and the Macro Assembler to drive A: using the following commands:
COPY B:MDISK.ASM A: <RETURN>
COPY B:MASM.EXE A: <RETURN>

4. Place Distribution Disk II in drive B: and COPY the Linker from subdirectory DEVEL on B: to drive A: using the following command:
COPY B: DEVEL\LINK.EXE A: <RETURN>

All the files that are required to assemble and link the MDISK.DVD are now on the disk in drive A:. The distribution disks can now be put out of harm's way, and you can assemble MDISK.ASM.

Assemble MDISK.ASM

5. To invoke the Macro Assembler, use the following command:
MASM <RETURN>

You'll then be prompted for the name of the file that is to be assembled:
Source filename [.ASM]:

Reply:
MDISK <RETURN>

You'll then be prompted in the following manner. To keep the name MDISK for the .OBJ file, and assuming you don't want a .LST or .CRF file, you can hit <RETURN> at each prompt.
Object filename [MDISK.OBJ]:
<RETURN>
Source listing [NUL.LST]: <RETURN>
Cross reference [NUL.CRF]:
<RETURN>

After MASM has done its work, you should see the words "Warning Errors" and "Severe Errors". Both should be "0"; the only error likely to occur is that you forgot to copy one of the support files to your working disk.

LINK it

6. To invoke the Linker, use the following command:
LINK <RETURN>

You'll then receive another series of prompts and can reply as indicated:
Object Modules [.OBJ]: MDISK
<RETURN>
Run File [MDISK.EXE]: MDISK.DVD
<RETURN>
List File [NUL.MAP]: <RETURN>
Libraries [.LIB]: <RETURN>

(After LINK has done its work, you should see the warning: "no STACK segment". That's no problem; none is

needed for a device driver.)

This completes the assembly and linking of the MDISK.DVD driver.

Clean up

7. You can now delete the unnecessary programs from your working disk by using the following commands:

DEL MDISK.OBJ <RETURN>
DEL LINK.EXE <RETURN>
DEL MASM.EXE <RETURN>
DEL *.ASM <RETURN>

8. Now copy MDISK.DVD to any boot disk from which you want to set up the memory disk upon boot-up.

Tell CONFIG.SYS

9. The last step is to warn MS-DOS that you have a device driver and to establish the size of the memory drive. Both of these are taken care of in CONFIG.SYS, an ordinary ASCII text file in which you can specify a number of system characteristics. In the event you do not presently have a CONFIG.SYS file on your bootable disk, it can be created with most word processors or line editors. Just make sure that the file your word processor produces is "plain ASCII." That is, it should include no print-formatting commands, and no "funny" characters. In WordStar, for instance, use the "non-document" mode. Other word processors that throw in odd characters for internal housekeeping should have a similar mode.

A quick way to write a short file such as this is to COPY to a disk file what you type at the console. Type:

COPY CON CONFIG.SYS <RETURN>

Then type in the lines you need. When finished, simultaneously press the CTRL and Z keys, and follow that with a <RETURN>. This copies what you typed to a file named CONFIG.SYS. (The CTRL-Z is the end-of-file marker.)

In any event, include the following command line in the CONFIG.SYS file for the bootable disk that has MDISK.DVD on it.

DEVICE = MDISK.DVD SIZE = XXX

Here, XXX specifies the number of kilobytes you wish to allocate to the memory disk. For a 768K machine, my experience has been that it should be in the range of 32K to 511K if you create only a single memory drive. (For additional memory drives, simply add additional DEVICE = lines.)

If you fail to specify the size of the memory disk, or specify one outside the range of 32K-640K, the memory disk will default to 32K.

As a note, one other option that can be included after the SIZE specification in the command line above is the start address for the MDISK.DVD. This is done by means of the START parameter. (What this is really for, I'm not sure. Someone else will have to write about how to use it.)

The way to specify the START parameter is to include it after the SIZE parameter.

DEVICE = MDISK.DVD SIZE = XXX START = <HEXADECIMAL ADDRESS>

Additional information about the improved MDISK driver can be found in the comments contained in the MDISK.ASM file.

Check things out

When you first boot up with the new CONFIG.SYS file, the memory disk will be installed as drive I:, and a short message will note this. (If you have multiple memory disks, subsequent drives will be labelled J:, K:, L:, etc.)

If MDISK.DVD cannot be located, or if you are using the old MDISK driver, you will get an error message saying that you have a bad or missing MDISK.

You can test the success of the memory-disk installation by copying a small file to it (such as your CONFIG.SYS file). Then do a DIR I: command. If your memory-disk size does not approximate the SIZE you specified in the CONFIG.SYS file, then you will more than likely have problems writing to the memory disk.

Following this procedure should keep you from running into dead ends.

Execute a CHKDSK I: command after writing a file to the memory disk. If CHKDSK reports a problem, go back to CONFIG.SYS and make the SIZE parameter smaller.

The main cause of problems is giving SIZE too high a value. As indicated above, it has been my own experience that you will not be able to get as large a RAM drive as you would expect. (Some RAM is reserved, evidently for such things as MS-DOS's own housekeeping and for small applications programs.)

Unfortunately, setting SIZE too large may not always produce an error message. On boot-up, I have been given the message indicating that the memory disk had been properly installed. Whenever I had allocated more than 511K for a memory disk on a 768K machine, however, I would have problems writing to it.

If you have less than 768K in your machine, you will probably not be able to get 511K for the memory disk. At work, for example, we are using a Z100 with 448K and can get a range of only 32K to 384K on the memory disk.

You may have to experiment with the SIZE parameter to discover the maximum MDISK size for your machine. That may require a bit of caution, however.

As I just noted, *my* only indication of trouble was that the memory disk was unusable. When other people have assigned too large a SIZE, however, they usually have gotten the "bad or missing MDISK" error message. The problem they have found is that setting a SIZE just a *little* too large can cause the boot process to hang up.

If you want to experiment, then, be sure to have an alternate boot disk handy. The bad SIZE does no harm to the disk or to the computer, but the disk won't be bootable until you change the SIZE value in CONFIG.SYS.

If all appears to be well, executing a CHKDSK command on the memory disk after boot-up will confirm whether it has problems. If this occurs, go back to CONFIG.SYS and try again with a smaller SIZE parameter.

And there you are

Following this recommended procedure will let you successfully assemble and link the improved MDISK driver. It may not be the only way of ending up with the desired result, but it works. It should keep you from running into dead ends.

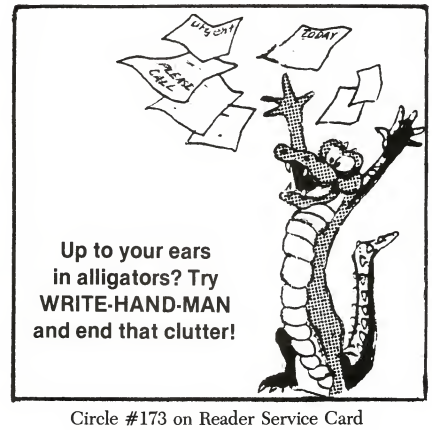
You may find yourself at another kind of dead end, of course, if you ever forget that your speedy memory disk is also volatile: if you turn off or reset the computer, you lose whatever you stored to the memory disk. You still have to go back to the physical disk in order to save anything permanently.

The improved memory disk will be a valuable addition to your Z100. Don't be afraid to push your machine to its maximum; there are no speed limits on the MDISK drive.

Happy motoring!

Additional Information

MS-DOS Version 2, Model #OS-61-50, $150.
MS-DOS Version 2 Programmer's Utility Pack, Model #CB-5063-16, $149.
Heath Company
Benton Harbor, MI 49022
800/253-0570 △



Circle #173 on Reader Service Card

The Eight-Bit World

Walter J. Janowski

It's been a busy month or two, with a lot of new items to discuss, including the long-awaited HDOS 3. So let's get right to work and not waste any time.

Eight-bit vendor roundup—update

I received a few letters from readers and vendors pointing out vendors of eight-bit products who were not mentioned in my column in *Sextant* #25 (November-December 1986). Let me clear up one point; the column listed just the vendors who had answered my earlier call for information about those who still carried eight-bit products. It was not intended to be a definitive listing of all eight-bit vendors.

One of two notable exceptions who did not send me information but deserve honorable mention is Sigmasoft and Systems, long a supplier of graphics-controller add-ons and hard-disk subsystems for the H8 and H89.

The other exception is Quikdata, Inc., supporting Heath products since way back—and still supplying software, add-ons, drives, and parts for the H8 and H89 systems.

Again, I urge any other suppliers I haven't mentioned to drop me a line. The eight-bit community can always use information on sources of support.

The *SEBHC Journal*

There does seem to be a definite resurgence of interest in the eight-bit community. Many of the suppliers seem to be becoming more verbal, new products are starting to show up, and the release of version 3 is even stirring up interest in the Heath Disk Operating System (HDOS) again.

Among the crowd is the *SEBHC Journal* published for the Society of Eight Bit Heath Computerists. This is a new monthly newsletter devoted solely to the Heath and Zenith eight-bit computer products. Subscriptions are $15 per year, with one year free if you submit an article that is accepted for publication.

The *Journal* is published by Leonard Geisler; like early editions of a few other newsletters I could mention, this one clearly displays its editor's opinions and biases. Mr. Geisler is obviously gung-ho about supporting the eight-bit machines (as well he should be), and the *Journal* is just as obviously a labor of love.

The newsletter is not a slickly produced publication. Much of the original copy is produced on a dot-matrix printer. Printing is of acceptable quality on 8½-x-11 loose-leaf paper, with each issue bound with staples.

Free advertising is accepted from vendors. That should make the newsletter an excellent source of information about eight-bit products, since motivation for vendors to participate is high.

The newsletter's content varies greatly from issue to issue; it ranges from one writer's personal experiences to some very juicy insights into some of the lesser-known features of the eight-bit machines.

The bottom line is that this is not a "professionally" produced publication, but it's chock full of useful information. I have yet to read an issue that didn't provide me with a useful tidbit that made my time well spent. There's also a lot to be said for just having a place to "hang out" where everything you read is about your machine.

It may not be for everybody, but I recommend it nonetheless. Individual issues are available for $2.50.

Annuity

I recently received a copy of a financial package called Annuity from P.C. Enterprises of Annandale, Virginia. The program consists of a series of handy little programs for calculating mortgage/loan interest, investment growths, etc. However, I did run into a little problem right from the start.

P.C. Enterprises sent me two copies, one on a hard-sectored and one on a soft-sectored diskette for CP/M. When I tried to run the soft-sectored copy, I received the message "not enough memory, program aborted." Puzzling over why 64 kilobytes in a CP/M machine would not be enough, I tried the hard-sectored disk—with the same result.

So okay, I've fiddled with my system enough to have changed some of the basic memory requirements. And I had a memory-resident utility loaded—Write Hand Man from TMSI. I tried unloading it. Same result. I unloaded EZCPR. Same result. What else could it be? An inspection of Annuity with DDT indicated that it was written and compiled in Turbo Pascal, but that gave no clues to the problem.

But wait—I had configured CP/M's basic input/output system (BIOS) to support both the H17 and H37 controllers, and that configuration increases the size of the BIOS somewhat. I managed to dig out an old bootable hard-sectored disk from the days before I had my H37 controller, and booted from the hard-sectored drive.

With the smaller BIOS loaded in memory, I was able to run Annuity. But it

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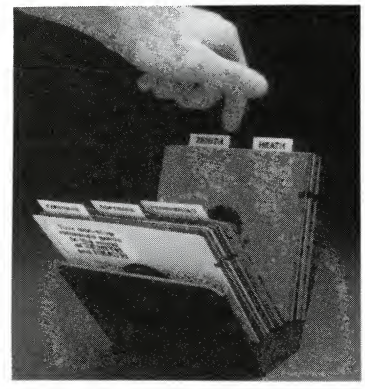

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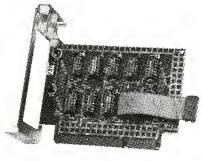

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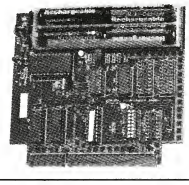

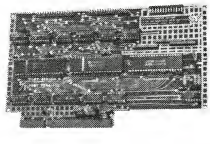

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seemed that the program's memory requirements must have been cut awfully close to be that sensitive.

I wrote to P.C. Enterprises about the problem, and was very impressed with their response. Within a few days, I received a phone call from the company. They apologized and explained that the original program was indeed written in Turbo Pascal, for use under the Microsoft Disk Operating System (MS-DOS); when it was compiled for CP/M, the memory requirements were not changed.

I was promised that a corrected version would be sent as soon as possible. The next day, I received a package via overnight express containing the improved version. It worked perfectly.

Altogether, at a price of only $19.95, this is a handy little package for anyone contemplating a mortgage, planning an investment, or the like.

Remembering a few disk basics

My recent addition of 96-track-per-inch drives to my system brought about a welcome increase in disk-storage capacity. But I was concerned about being able to use my existing disks at the higher density since they were not certified to work at 96 t.p.i.

Before I delve into how I handled that, though, it might be well to back up and go into some disk basics.

When blank diskettes are packaged for sale, they are rated as single-sided or double-sided, single-density or double-density, and 48- or 96-t.p.i. (or possibly 40-track or 80-track, the same thing). They're priced accordingly.

However, most diskettes are *manufactured* identically. The price and rating are not so much a function of the manufacturing process, but instead a reflection of the amount of testing (certification) that has gone into the disk after manufacturing.

That's not always absolutely true, of course. Because 96-t.p.i. disks have much narrower tracks than 48-t.p.i. disks, they tend to be more sensitive to changes in humidity, etc.; therefore, some manufacturers offer 96-t.p.i. disks that expand and contract less.

Frequently, a single-sided 48-t.p.i. disk may be identical to a double-sided 96-t.p.i. disk; but it is not guaranteed to perform at the higher rating. The additional testing drives up the price of the higher-rated diskettes; often, though, a lower-priced alternative may be successfully substituted.

But a few words of warning before we all run off to the local bargain house to stock up on "Wizzo Disks." First of all, a disk that fails high-density certification may still pass that of a lower rating. Therefore, the disk you buy may have already been proven unreliable at higher ratings, and been legitimately packaged at a lower rating.

Also, none of this in any way affects *other* aspects of disk quality. A disk that functions reliably at 96 t.p.i today will nevertheless be useless if the oxide coating starts to flake off in a week or two.

The bottom line in disk quality is that you get what you pay for. Stick with a reputable disk supplier—whether or not you plan to use the diskettes at a higher density than rated. And remember, the manufacturer's warranty applies only to use of the diskette at its rating. Don't gamble with your valuable data.

BD and CERTIFY

Well, I just said that we shouldn't gamble with valuable data. However, a lot of my work is temporary. A file I create today I may decide to erase next week, or maybe I'm fooling with information that really wouldn't be missed if it were lost.

What I need is the ability to check out my diskettes myself to establish a reasonable certainty of performance. I don't need to worry about relatively demanding conditions such as fluctuating humidity, transferring disks to strange machines, etc. I really just want to tell if a disk has any glaring flaws guaranteed to affect data storage.

Of course, HDOS has always come with a media test; I can use either the TEST17 or TEST37 utility to inspect a disk to find defective sectors. And INIT will let me "lock out" the bad sectors so that HDOS will not attempt to store data in these areas.

CP/M, though, fails to provide a similar utility. Once again, the world of public domain software comes to the rescue.

I have found and have been using two media-test utilities. One is BD by Irv Hoff, and the other is CERTIFY by Carl Beck.

BD (Bad Disk) is the simpler of the two.

The program is invoked with the command BD <D>:, where <D>: is the name of the drive containing the formatted disk to be checked.

As BD progresses, it will display a block count (at 2,048 bytes to a block) and a report of each bad block it encounters. At completion, it creates a directory entry called [LOCKED].OUT, and assigns the defective areas to it. Having this "phantom" file prevents the operating system from attempting to store data in those areas. (It will show up in the DIRectory; if you want to protect it from tampering or accidents, you can always use STAT to set the read-only and system flags.)

If the disk already contains files prior to the check, BD will also report the names of any files that it is unable to read.

CERTIFY, while it accomplishes the same end, is a flashier program.

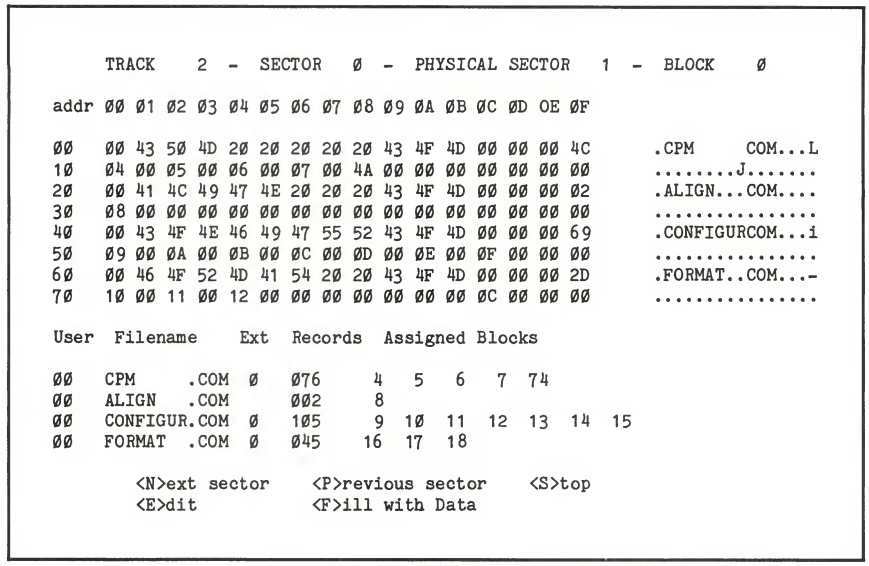
Running CERTIFY causes it to report on the overall status of the disk in question. It provides information on the number of logical tracks, directory entries, disk capacity, etc.

You are then faced with a menu. From the menu, you can choose to inspect the

disk; you can also choose to lock out bad sectors, or not; you can inspect the directory to get block locations of files; and you can do a hexadecimal/ASCII dump of any of the areas on the disk. (See Figure 1.) With the dump facility, you have a limited editing ability to repair damaged data on a disk; but repair of *physical* damage is, of course, impossible.

After using these programs, I was able to certify as reliable for use at 96 t.p.i. about 95% of the 48-t.p.i.-rated diskettes I already owned. The other 5% exhibited such massive failures that, had I attempted to use them without testing, the results would have been disastrous. So far, I have not experienced any problems with the disks that checked okay.

Either or both of these programs would be a valuable addition to any system. They are available on the CP/M Roundtable Library on GEnie, and on bulletin boards around the country.



```
      TRACK    2  -  SECTOR   Ø  -  PHYSICAL SECTOR   1  -  BLOCK    Ø

addr ØØ Ø1 Ø2 Ø3 Ø4 Ø5 Ø6 Ø7 Ø8 Ø9 ØA ØB ØC ØD OE ØF

ØØ   ØØ 43 5Ø 4D 2Ø 2Ø 2Ø 2Ø 2Ø 43 4F 4D ØØ ØØ ØØ 4C      .CPM     COM...L
1Ø   Ø4 ØØ Ø5 ØØ Ø6 ØØ Ø7 ØØ 4A ØØ ØØ ØØ ØØ ØØ ØØ      ........J.......
2Ø   ØØ 41 4C 49 47 4E 2Ø 2Ø 2Ø 43 4F 4D ØØ ØØ ØØ Ø2      .ALIGN...COM....
3Ø   Ø8 ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ      ................
4Ø   ØØ 43 4F 4E 46 49 47 55 52 43 4F 4D ØØ ØØ ØØ 69      .CONFIGURCOM...i
5Ø   Ø9 ØØ ØA ØØ ØB ØØ ØC ØØ ØD ØØ ØE ØØ ØF ØØ ØØ ØØ      ................
6Ø   ØØ 46 4F 52 4D 41 54 2Ø 2Ø 43 4F 4D ØØ ØØ ØØ 2D      .FORMAT..COM...-
7Ø   1Ø ØØ 11 ØØ 12 ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØC ØØ ØØ ØØ      ................

User  Filename    Ext  Records  Assigned Blocks

ØØ    CPM      .COM  Ø   Ø76     4   5   6   7  74
ØØ    ALIGN    .COM      Ø02     8
ØØ    CONFIGUR.COM  Ø   1Ø5     9  1Ø  11  12  13  14  15
ØØ    FORMAT   .COM  Ø   Ø45    16  17  18

        <N>ext sector     <P>revious sector     <S>top
        <E>dit            <F>ill with Data
```

Figure 1. Part of the directory of a CP/M disk, as shown by the CERTIFY disk-examination utility. CERTIFY first reports on the overall quality of the disk. Then it presents you with a menu; examining the directory area is one of the options provided.

HDOS 3 at last!

It's here. It exists. It's in my very hands. HDOS 3.

It's been, I believe, about seven years since the release of HDOS 2. Since that time, the impending release of version 3 has developed an air of mystery and expectation so strong that we should stop to put it in perspective.

As operating systems go, HDOS has hung around a lot longer than others from the days when every disk-equipped microcomputer had its own operating system.

From a "practical" standpoint, HDOS 3 has no reason to exist. Heath/Zenith had decided not to develop it. Finally, after pressure from the user community, Heath/Zenith agreed to finance the development, but guaranteed it would be the last release. Bill Parrott was to be one of the developers.

But there were problems, and there were mix-ups, and there were delays. After giving initial support, Heath/Zenith eventually decided to give up on it. Finally, though, Bill took on the whole project. It was a *lot* of work. He completed 3 pretty much on his own and donated it to HUG, which then placed it in the public domain.

What I'm getting at is—keep in mind where HDOS came from. It is a hacker's system. Documentation is sparse at best; much of what it can do will be learned from trial and error, and by studying the source code.

Those unwilling to explore will complain about the lack of documentation. Some may point out what it does that it shouldn't, and what it doesn't that it should. Just remember it almost wasn't here at all.

Now that HDOS 3 *is* here, let's go out of our way to support it. Let's see new software that exploits its new features, as well as updates to existing software to take advantage of it.

If you think it needs to do something it doesn't, find a way to make it do it. If you don't like something it does, find a way to patch it out. If you think it needs documentation, write some! But for goodness sake, make sure the information gets around.

Let's get *Buss*, *H-Scoop*, and the bulletin boards buzzing again with HDOS.

HDOS 3—overview

There's a lot to talk about in HDOS 3, and a lot to learn. As of this writing, I've had my copy just a few weeks, and I haven't been able to do anything more than scratch the surface of its new features. In this issue, I'll try to broadly cover some of the major changes; as I become more familiar with the system, I'll continue to report on it in future columns.

I received my copy of HDOS 3 from *Sextant*, passed along to me on seven hard-sectored diskettes. (If you get it directly from Bill Parrott, you can get it on either soft-sectored or hard-sectored disks.) Bringing it up on my system for the first time required dusting off a few brain cells that I haven't used for a long time. (How long has it been since you configured an HDOS system from scratch using the source disks?)

The first chore was hooking up the old hard-sector controller. I then booted my old HDOS 2 system; then (with write-protect tabs in place) I thought I'd first inspect the contents of the distribution disks. No dice—2 cannot read a disk INITed by 3, at least not on hard-sectored disks. (HDOS 3 can read version 2 disks, however. More on this later.).

Okay, insert the system disk, close my eyes, cross my fingers, and boot. The first thing I see is good old "Action? <BOOT>". Doggone, I patched that out of 2 long ago. Oh, well, hit RETURN.

Well, for one thing, 3 boots a whole lot faster than 2 did. But everything was in uppercase. Oh yeah, you have to SET TT: NOMLI or something. (I told you it's been a long time.)

Anyway, rule number one is: Never play with your distribution disks. I copied all seven disks onto two soft-sectored disks, and SYSGENed one so it would be bootable.

When I tried to boot, it just stared back at me. Oh yeah, it's all starting to come back now. On a newly INITed disk, type spaces to determine baud rate.

Basically, creating a system from the distribution disks is done exactly the way it was with 2, so I hope you never threw away those manuals.

The one notable difference is in using the SET command to configure TT:. There is now an additional option: SET TT: H19, which configures all options to the H/Z19 terminal. Also, TT: is now an external device driver, rather than part of the system.

HDOS 3 gets a little "cutesy" at times. A humorous message shows up in the "Action?" options at boot-up, and another appears after typing BYE when finished. During booting, 3 identifies itself in a flashy graphics banner. (Remember, the H/Z19 *can* handle graphics.)

I don't find the humor distracting, but I've heard a few criticisms. I suppose it could be a legitimate criticism that the humor shows a lack of "professionalism." But HDOS 3 itself is kind of an enigma. I think we should find all the fun in it we can.

As I said earlier, documentation is very sparse, consisting entirely of three small text files: one general README file, and two HELP files (one for SYSCMD and one for PIP). There is also a utility program,

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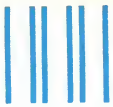

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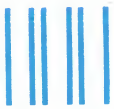

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WHAT.ABS, which identifies program, author, and compilation date and time.

With version 3, HDOS has become a completely memory-resident system—no more overlays. It is also ORG 0. Making it completely resident increases speed by eliminating the need for frequent disk accesses; ORG 0 frees up the lower 8K of memory, recognizing the full 64K, rather than 56K as in 2.

Major changes to SYSCMD.SYS reflect many of the ideas Jim Teixeira incorporated into his Super Sysmod2 for HDOS 2. Most commands can be abbreviated to one or two letters. CATalogs can be sorted alphabetically. Other new changes include incorporating the old FLAGS utility into the resident system; it is no longer a stand-alone program.

One of the most notable features of 3 is its ability to process batch files, much as is done in MS-DOS. After creating an ASCII file containing a series of system commands, and naming it with a .BAT extension, these commands may be executed by the command <FNAME>, where <FNAME> is whatever file name you selected. HDOS 3 will also search for and execute the AUTOEXEC.BAT file at boot time.

PIP.ABS is no longer reloaded every time it's called; it remains co-resident with SYSCMD.SYS whenever possible.

Also, PIP now has approximately 50 switches. (See Figure 2.) Along with the switches already supported in version 2, PIP can now sort the directory alphabetically, by date of creation, or by number of accesses. Most PIP switches can also be used with the CAT command. And there are a few unused switches included so that users can patch in special commands of their own.

PIP also now incorporates the old FLAGS program. Flags on files may be set or cleared using PIP, and several new flags are now available. Along with the original S, L, W, and C flags, version 3 also includes an A flag—which can be used to support an archiving utility. There's also a B flag that indicates a file has bad sectors, and a D flag that allows a file to be read and written to, but not deleted. And there's an undefined U flag available for the individual user to support.

Again, the new features are too many to adequately discuss in one sitting, so I'll be covering others in more detail in future columns. Meanwhile, HDOS 3 looks like an exciting new addition to the eight-bit world, and I'm anxious to explore it further.

```
PIP Command Format:

        DEST=SOURCE1,...,SOURCEn/SWITCH1.../SWITCHn

Verb Switches            Meaning
-------------            -------------------------------------------------
/L[IST]              ** Standard Directory Listing
/F[ULL]                 Extended Directory Listing
/B[RIEF]             ** Brief Directory Listing
/M[INIMUM]              Minimum Directory Listing (One Column List)
/G[ROUP]                FGN LGN LSI Directory Listing

/SET[FLAG]:f..          Set Flags on a File (! = ONLY these flags set)
/CLR[FLAG][:f..]        Clear Flags on a File (default = all but 'C')

/DEL[ETE]            ** Delete Source File(s)
/R[ENAME]            ** Rename Source File(s) to Destination Name(s)
/CRC                    Checksum Source File(s)

/MOU[NT]             ** Mount Volume on Device
/DIS[MOUNT]          ** Dismount Volume from Device
/RES[ET]             ** Dismount/Mount Volume on Device

/VERS[ION]           ** Display Current Version of PIP
/ID                     Same as /VERSION plus a little data

/?[??]                  Display this file

/FUBAR                  Available for you to Patch
/SNAFU                  Available for you to Patch

/S[YSTEM]            ** Include System Files (S flag) Also
/FL[AG]:f..             Include Files with Specified Flags
/NOF[LAG][:f..]         Include Files without Specified Flags
/BEF[ORE][:dd[-mmm[-yy]]]  Include Files Created Before dd-mmm-yy (def.= today)
/CUR[RENT][:dd[-mmm[-yy]]] Include Files Created On dd-mmm-yy (def.= today)
/AFT[ER]:dd[-mmm[-yy]]  Include Files Created After dd-mmm-yy
/AGE:n                  Include Files 'n' Days old or older
/AC[CESS]               Use Access Date instead of Creation Date
/COU[NT][:n]            Include Files with Access Count >= n (def.= 1)
/NOC[OUNT][:n]          Include Files with Access Count < n  (def.= 1)

/ALL[OCATE]          ** List Disk Allocation, NOT Size
/P[AGE][:nn]            Paginate Directory Listing (default = 55 files/page)
/COL:nn                 Number of Files across Page for /B Listing

/-                      Reverse Effect of Wildcard

/Q[UERY]                Include ONLY User Selected Files

/SO[RT][:n[r]e[r]d[r]a[r]c[r]]  Sort Files for DEST Usage (default = NE)
/REV[ERSE]              Sort Descending (Normally Ascending)
/SU[PRESS]           ** Supress Trailing Messages, Headers, Status Line

/V[ERIFY]               Compare CRC of SOURCE & DEST
/D[ATE]                 Use Today's Date on Copy (default = source date)
/ATT[RIB][:f..]         Set DEST File Flags on Copy (default = source flags)
/C[ONTIG]               Copy File(s) Contiguous
/SA[FE]                 Ask before overwriting an existing file
/FOR[CE]                Override W and D Flags (COPY DEL REN)
/K[EEP]                 Keep DEST File Flags on Copy (Used ONLY with /FORCE)

/XXX    /YYY    /ZZZ    Available for you to Patch

** = From previous version of PIP
```

Figure 2. HDOS 3's description of the switches now available to PIP. This information is contained in the HELP.H19 file; the command PIP HELP will send it to the screen as four pages of information.

'Til next time

As always, I welcome your comments and suggestions. Drop me a line, and be sure to include a self-addressed stamped envelope if you're using U.S. mail. Remember, electronic mail gets answered first.

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Put a New Face on Your '100's Clock

This Z-BASIC program supplies hands that move, plus an alarm. The new clock also chimes the appropriate number of times on the hour.

Angelo Giambra

Here's a nifty program that ought to generate some interest around your home or office. It nicely demonstrates the superior graphic capabilities of the Z100 while turning your dull monitor into a colorful alarm clock. (If you have a black-and-white monitor, the clock will be drawn in white.) The program was written in Z-BASIC under the Microsoft Disk Operating System (MS-DOS) version 2. (It will run equally well under Zenith's implementation of MS-DOS 1, the Zenith Disk Operating System.)

After keying in the program (shown in Listing 1), save it to disk as CLOCK.BAS. Note: If you type it in under Z-BASIC, *do not run it until you have saved it*—the program exits Z-BASIC when it is ended.

When you run CLOCK, a clock face will appear, complete with moving second hand, showing the time and date. CLOCK gets the time and date from the operating system; so long as you keyed in the date and time when you powered up your machine, the date and time displayed will be correct.

While the clock is running, it will chime (BEEP) the appropriate number of times on the hour. On the half hour, the clock will chime once.

If you want to change the time, you may set it by pressing S (Set time). The program will ask you to enter the correct time; it will change the operating-system time, and the clock face will then reappear with the new time.

You may even set an alarm by pressing A (Alarm). The program will ask you to enter an alarm time, and the clock face will then reappear. The alarm will go off at the designated time provided that the program has been running continuously since you set the alarm. The alarm will beep 50 times, or until you press C (Cancel).

If you don't have a color monitor, press B (Black and white) and the program will draw the clock in white.

Pressing any key other than those just mentioned causes the program to end and Z-BASIC to be exited. You will be returned to the operating system. In this manner, you may do other work on your system when you need to. When you want to see the time, simply key in ZBASIC CLOCK; the clock will return, having retrieved the correct time and date.

When you want to see the time, simply key in ZBASIC CLOCK and the clock will return.

Angelo Giambra is a software specialist for General Electric in Largo, Florida. An avid computer hobbyist, he specializes in writing utilities, and has written a full-blown spelling checker in assembler.

Line by line

Here's how the program works.

Line 10 sets up the colors for the clock hands and face.

Line 20 prompts you to enter the time. Then it sets the operating-system time: TIME$=SVE$.

Line 30 uses the sine and cosine functions to print the numbers 1 through 12 in a circle around your screen.

Lines 40-60 draw the border of the clock.

Line 70 gets the current operating-system time (SVE$=TIME$); then line 80 checks to see if one second has passed.

Line 90 checks to see if you have pressed a character from the keyboard. If so, control branches to line 330.

Line 100 determines if it's a.m. or p.m. by testing whether the hour is greater than 12.

Line 110 prints the date and calls a subroutine which figures out what day it is.

Line 120 checks to see if the value of the seconds is zero. If so, the hands of the clock must be moved.

Lines 130-250 calculate where the hands should be drawn for the hours, minutes, and seconds. This is done by converting the time to points on a circle. Points representing hours, minutes, and seconds are calculated and placed on an invisible inner and outer circle. Lines are then drawn to connect the points, thus forming the hands of the clock.

Line 260 checks to see if the time matches the alarm time. If so, the value of CHIME is set to 50.

Line 270 determines if the chime is greater than 0. If so, it causes your terminal to BEEP once, then decrements the chime by 1.

Lines 290-310 blank out the minute and hour hands once each minute so that the hands may be moved to a new position. They also determine if the time has reached the hour or half hour. If so, the chime is set to ring.

Lines 330-370 examine input from the keyboard and call the appropriate routines.

Line 380 turns the colors to white for black-and-white monitors.

Lines 390-480 are called when you press A (Alarm). They set the variable ALARM to the alarm time and normalize it in case you haven't included seconds. For example, if you input 9:6 (six minutes after nine), ALARM is normalized to 09:06:00.

Lines 480-620 calculate the correct day for any given date. This routine will work for any year from 1984 to 1999, so the clock ought to last you a long time.

Line 630 is an all-purpose error-message line. There aren't too many

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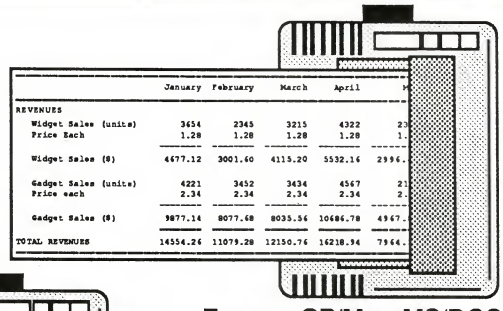

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Listing 1. CLOCK.BAS runs under Z-BASIC on the Z100. The program obtains the current time from the operating system and displays it on your screen in the form of a clock face with a moving second hand. It also displays the current date, and allows you to reset the time and set an alarm.

```
10 ON ERROR GOTO 630:COLOR 6,0:CLS:C1=1:C4=4:C2=2:C5=5:GOTO 30
20 ON ERROR GOTO 625:CLS:LOCATE 10,30:PRINT"ENTER TIME (HH:MM:SS)":
      LOCATE 11,30:INPUT SVE$:TIME$=SVE$:CLS
25 ON ERROR GOTO 630
30 FOR I = 1 TO 12:X=I:X=(X*30)-1:X=X*(2*(22/7))/360:P1=SIN(X)*23+37:
      P=COS(X+(22/7))*10+13:LOCATE P,P1:PRINT I:NEXT I
40 CIRCLE (300,112),49,C1,,,.48999
50 CIRCLE (300,112),210,C4,,,.48999
60 CIRCLE (300,112),220,C2,,,.48999
70 SVE$=TIME$
80 IF TIME$=SVE$ THEN 80
90 A$=INKEY$:IF LEN(A$)>0 THEN 330
100 LOCATE 13,37:IF MID$(TIME$,1,2)< "12" THEN PRINT "AM" ELSE PRINT "PM
110 LOCATE 1,70:GOSUB 490:PRINT DATE$:LOCATE 2,71:PRINT DY$
120 A=VAL(MID$(TIME$,7,2)):IF A=0 THEN GOSUB 290
130 MIN=VAL(MID$(TIME$,4,2)):TICK=MIN/2:HOUR=VAL(MID$(TIME$,1,2))*5
140 A=(A*6):A=A*(2*(22/7))/360:X=SIN(A)*165+300:Y=COS(A+(22/7))*82.5+112
150 X1=SIN(A)*50+300:Y1=COS(A+(22/7))*25+112
160 MIP=(MIN*6):MIN=MIP*(2*(22/7))/360:M=SIN(MIN)*165+300:
      MA=COS(MIN+(22/7))*82.5+112
170 MIN=(MIP-2)*(2*(22/7))/360
180 M1=SIN(MIN)*50+300:MA1=COS(MIN+(22/7))*25+112
190 MIN=(MIP+2)*(2*(22/7))/360
200 M2=SIN(MIN)*50+300:MA2=COS(MIN+(22/7))*25+112
210 MIP=(HOUR*6+TICK):HOUR=MIP*(2*(22/7))/360:H=SIN(HOUR)*140+300:
      HA=COS(HOUR+(22/7))*70+112
220 HOUR=(MIP-2)*(2*(22/7))/360
230 H1=SIN(HOUR)*50+300:HA1=COS(HOUR+(22/7))*25+112
240 HOUR=(MIP+2)*(2*(22/7))/360
250 H2=SIN(HOUR)*50+300:HA2=COS(HOUR+(22/7))*25+112:LINE(XS,YS)-(XS1,YS1),0:
      LINE (M1,MA1)-(M,MA),C2:LINE -(M2,MA2),C2:LINE (H1,HA1)-(H,HA),C5:
      LINE -(H2,HA2),C5:LINE(X,Y)-(X1,Y1),C4:XS=X:YS=Y:XS1=X1:YS1=Y1
260 IF TIME$=ALARM$ THEN CHIME=50:ALARM$=""
270 IF CHIME>0 THEN BEEP:CHIME=CHIME-1
280 GOTO 70
```

→

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```
290 LINE(M1,MA1)-(M,MA),0:LINE -(M2,MA2),0:LINE(H1,HA1)-(H,HA),0:LINE -(H2,HA2),0
300 IF MID$(TIME$,4,2)="00" THEN CHIME=VAL(MID$(TIME$,1,2)):
      IF CHIME>12 THEN CHIME=CHIME-12
310 IF MID$(TIME$,4,2)="30" THEN CHIME=1
320 RETURN
330 IF A$="S" OR A$="s" THEN 20
340 IF A$="A" OR A$="a" THEN 390
350 IF A$="C" OR A$="c" THEN CHIME=0:LOCATE 5,5:PRINT" ":GOTO 120
360 IF A$="B" OR A$="b" THEN 380
370 CLS:SYSTEM
380 C1=7:C2=7:C4=7:C5=7:COLOR 7,0:CLS:GOTO 30
390 CLS:ALARM=1:LOCATE 10,30:PRINT "ENTER ALARM TIME (HH:MM:SS)":
      LOCATE 11,30:INPUT ALARM$
395 HOUR=0:MINUTE=0:SECONDS=0
400 HOUR=VAL(ALARM$):I=2:IF LEN(ALARM$)<3 THEN 450
410 IF MID$(ALARM$,I,1)<>":" THEN I=I+1:GOTO 410
420 I=I+1:MINUTE=VAL(MID$(ALARM$,I,LEN(ALARM$)))
430 IF MID$(ALARM$,I,1)<>":" THEN I=I+1:IF I<LEN(ALARM$) THEN 430
440 SECONDS=VAL(MID$(ALARM$,I+1,2))
450 ALARM$="00:00:00":MID$(ALARM$,1,2)=RIGHT$(STR$(HOUR),2):
      MID$(ALARM$,4,2)=RIGHT$(STR$(MINUTE),2):
      MID$(ALARM$,7,2)=RIGHT$(STR$(SECONDS),2)
460 FOR I = 1 TO LEN(ALARM$):IF MID$(ALARM$,I,1)=" " THEN MID$(ALARM$,I,1)="0"
470 NEXT I
480 CLS:GOTO 30
490 DT=(DATE MOD 7) + ZZZ
500 YR=VAL(MID$(DATE$,7,4))
510 DT=DT+YR-1984:IF DT>6 THEN DT=DT-7
520 YR=INT((YR-1981) / 4)
530 DT=DT+YR:IF DT>6 THEN DT=DT-7
540 ON DT GOTO 560,570,580,590,600,610
550 DY$="SATURDAY":GOTO 620
560 DY$="SUNDAY":GOTO 620
570 DY$="MONDAY":GOTO 620
580 DY$="TUESDAY":GOTO 620
590 DY$="WEDNESDAY":GOTO 620
600 DY$="THURSDAY":GOTO 620
610 DY$="FRIDAY":GOTO 620
620 RETURN
625 RESUME 20
630 CLS:PRINT"DATE NOT SET -- ABORTING":SYSTEM
```

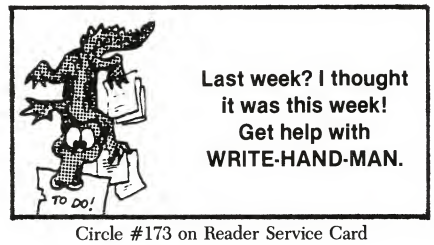
errors likely to occur. One is to have your operating system set for NODATE; other than that, all you have to watch out for is entering invalid time values.

If you want to bulletproof the program, you might want to look at line 20, where you enter the time, and line 400, where the alarm-handling begins. You could put in code that would simply re-display the prompt in the event the user entered an invalid time. And you could add code to set to zero the minutes and seconds values used by line 400; at present, it expects the user to specify these values.

As with any short program like this, there are probably lots of refinements that you might want to think about. Experimentation and tinkering are always in order!

Sorry!

There's only one problem with this program that I can think of. Now you have no excuse to be late for your appointments! △



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Circle #118 on Reader Service Card

Set Epson Printer Functions on the '100 or '150

The program source code appears in versions for MS-DOS, CP/M-86, and CP/M-85.

Richard L. Mueller

Back in 1984, I purchased an Epson FX-80 printer to use with my H100. Now it also works with my Z160. (I have a switch between the two microcomputers.) When I bought the Epson, I had a need, and still do, to be able to set it to handle special print modes.

For example, I need to set the printer to print in condensed mode for assembly language listings; to get better print quality at times for WordStar documents, I want it to double strike; before printing certain text files, I set the left margin over a few columns; and so forth. In order to accomplish my work, in other words, I need to be able to select certain print modes and functions for my FX-80 via a utility or set of utilities.

Currently, I use my H100 and Z160 to accomplish a number of tasks that involve using WordStar, Word, Multiplan, Lotus, Condor, various assemblers, FORTRAN, Pascal, C, etc. On the H100, I run under the Zenith Disk Operating System (Z-DOS), version 2 of the Microsoft Disk Operating System (MS-DOS), CP/M-85, and CP/M-86. On the Z160, I run under MS-DOS 2 and the version of CP/M-86 made for the IBM Personal Computer.

There have been magazine articles on setting printer features. There have even been small utilities available for purchase, but none was able to fulfill my needs. Some of the printer functions that I needed were missing; more importantly, there were no utilities that worked for all the operating systems that I have.

I solved my problem by writing a set of utilities (SPF—Set Printer Functions for the Epson FX-80), one utility for each of the operating systems. The user types in the same command line to call each utility; the utilities each display the same menu-selection page; and they each provide the same method for the user to request individual printer functions. In this article, I will describe each version and include the source code for each of them.

Although the utilities were written specifically for the Epson FX-80 printer, the source code should allow you to modify, enhance, and/or adapt the utilities to support your own particular needs and printers.

Using SPF

The SPF utility is called by typing the file name of the .COM file, if the file is on the default drive. Otherwise, precede the file name with the drive name (e.g., B:SPF).

After the SPF utility is loaded, a selection menu will appear—as shown in Figure 1. At the bottom, there will be a ?? prompt; to select an option/request, just enter the one- or two-character request code (in upper- or lowercase) that appears just to the left of each of the menu items. To select condensed printing, for instance, you would type SC.

If the request is legal (that is, one of

```
SPF - SET PRINTER (EPSON) CONTROL FUNCTIONS...
Copyright (C) 1986 Richard L. Mueller, Ph.D.

Print Modes:
 SC / CC  - Set / Clear Condensed Printing
 SX / CX  - Set / Clear Enlarged Printing
 SM / CM  - Set / Clear Emphasized Printing
 SP / CP  - Set / Clear Proportional Printing
 SD / CD  - Set / Clear Double Strike Printing
 SE / CE  - Set Elite Chars / Clear = Set Pica Chars

Paper Functions:
 SS / CS  - Set / Clear Skip over Paper Perforations
 S8 / C8  - Set 8 LPI / Clear = 6 LPI
 SL / CL  - Set Left Margin Over 2 Columns / Clear = Reset

MISC. Functions:
 B     - Clear Printer Buffer
 E     - Eject Paper - New Page
 I     - Initialize Printer
 Q     - Quit - Return to MS-DOS

??
```

Figure 1. SPF is a set of utilities that allow you to set Epson printer-control functions for use with your '100 or with Zenith's IBM compatibles. Upon being called, SPF will display this menu on the screen. At the ?? prompt, enter the one- or two-letter code for your selection. Except for the specification of the operating system in the "Quit" line, the menus for the Z-DOS/MS-DOS, CP/M-86, and CP/M-85 versions are identical.

Richard L. Mueller is a senior consultant in the Sales Support group at Control Data in Minneapolis, and has been working in the computer field since 1961. His home computers are an H100 and a Z160.

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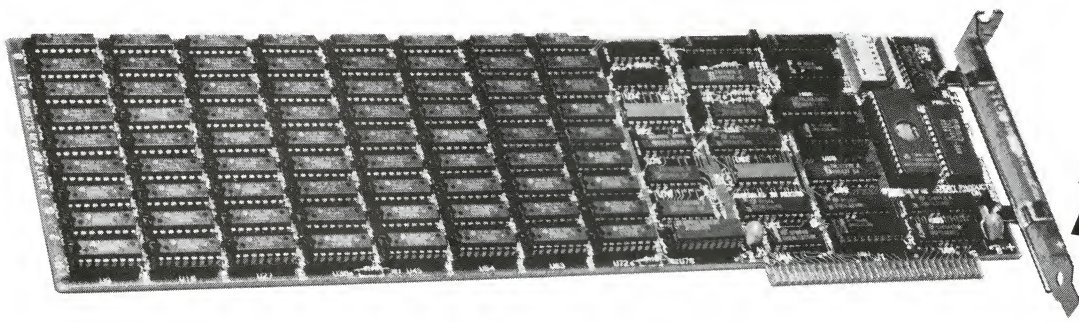

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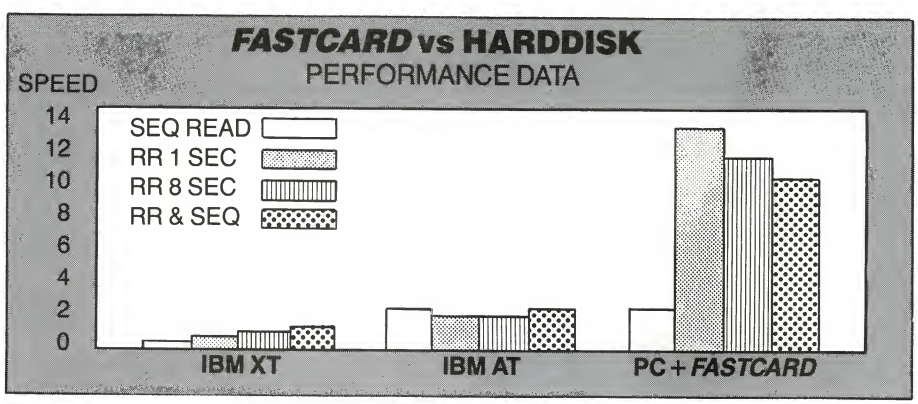

This graph shows benchmark test results of a PC equipped with *FASTCARD* versus a PC-XT and PC-AT. These tests were run by a major independent testing laboratory using their standard disk performance benchmark tests.

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those shown on the menu), and if the printer is ready, the request is processed immediately. (You won't even see the second character of a two-character request or the first character of a one-character request.)

Thereafter, you can type Q to exit; the next document you print will be handled in accordance with the option(s) you just selected.

However, if the request is legal but the printer is not ready, the entire request will be displayed to the right of the ?? prompt; it will remain there until the printer is made ready.

If the request is illegal, an error message—"Illegal Request. . . Try Again . . ."—is displayed momentarily; then it is erased, along with the illegal request. This allows the user to re-enter a new request.

After a request is successfully executed, you can enter another request since multiple printer formats work together in some cases. Or you can enter Q (for quit) to exit back to the operating system. Try various options and functions. You can use both upper- and lowercase.

If you wish, you can modify or enhance SPF for your particular needs and printers.

I would suggest that this utility be put on all your bootable disks for quick access when you need it.

Z-DOS/MS-DOS

First, let me discuss the Z-DOS/MS-DOS utility. If this utility interests you, the first step is to type in the 8086/8088 assembly language source code presented in Listing 1. Use your favorite Z-DOS/MS-DOS editor (such as Microsoft's line editor EDLIN).

The source code shown in Listing 1 will work for either the H/Z100 or the H/Z150 and Heath/Zenith's other IBM-PC compatibles. Which machine it runs on depends on the setting of the ZFLAG variable. Assemble the source code using the Microsoft Macro Assembler, MASM (included in Heath/Zenith's Programmer's Utility Pack). With ZFLAG set to 0, you will generate code that will execute on the H/Z100. With ZFLAG set to 1 (or, for that matter, any non-zero value), code will be generated to execute on the H/Z150 (and other IBM-PC compatibles).

The difference between the version of SPF that will be produced for execution on the H/Z100 and the version produced for the IBM-PC compatibles is in just one area: the control (or escape) sequences that control cursor positioning and clearing of the screen. The H/Z100 uses escape sequences that are unique to the H/Z100 and earlier Heath/Zenith machines.

The '150 and the other compatibles use a special system interrupt assigned to process requests for screen functions

Listing 1. SPF.ASM will assemble and link under Z-DOS/MS-DOS. (See Figure 2 for the commands involved.) SPF.COM will set up an Epson printer for its various printing features (character size, etc.). The operation of the Z-DOS/MS-DOS version is identical to that of the versions for CP/M-86 and CP/M-85. (See Listings 2-4.) Note that, as given here, the ZFLAG variable is set to 1; the executable program will then run on a Z100. Setting ZFLAG EQU 0 will produce a version for the Z150 or other IBM compatible. (The Z150 version will require ANSI.SYS on the boot disk. See text.)

```
                PAGE    ,132
                TITLE   'SPF - Set (EPSON) Printer Functions'

;               Set various printer functions for the Epson printer
;               such as character size, left margin, form feed, etc.

;               ZDOS / MS-DOS V2 H/Z100 Version (8086/8088 Code).
;
;               and...
;
;               MS-DOS V2 for the H/Z100-PC Series

;               Program is MENU driven for ease of use....

;               Copyright (C) 1984 Richard L. Mueller, Ph.D.

;               1 October 84.

;               Defines....

ZFLAG           EQU     1               ;0=H/Z100; 1=H/Z100-PC

DOSI_TERM       EQU     20H             ;terminate - return to ZDOS/MS-DOS
DOSF_CONIN      EQU     1               ;console input
DOSF_PRINTOUT   EQU     5               ;print a char
DOSF_OUTSTR     EQU     9               ;display string to $
DOSI_FUNC       EQU     21H             ;ZDOS/MS-DOS function interrupt

CC_ESC          EQU     1BH             ;escape char
CC_CR           EQU     0DH             ;CR
CC_LF           EQU     0AH             ;line feed
CC_EOF          EQU     1AH             ;end-of-file

                SUBTTL  Main Program...
                PAGE
SPF             SEGMENT
                ASSUME  CS:SPF,DS:SPF,ES:SPF,SS:SPF
                ORG     100H            ;start of program area
START:
                JMP     SHORT BEGIN     ;jump around copyright info

                DB      'Copyright (C) 1984 Richard L. Mueller, Ph.D.'

BEGIN:
                MOV     DX,OFFSET MENMSG
                MOV     AH,DOSF_OUTSTR
                INT     DOSI_FUNC       ;display menu

LOOP:
                MOV     DX,OFFSET IREQ  ;request input msg
                MOV     AH,DOSF_OUTSTR
                INT     DOSI_FUNC

                MOV     AH,DOSF_CONIN   ;console input request
                INT     DOSI_FUNC       ;get 1st char of request
                AND     AL,5FH          ;allow both upper and lower case
                CMP     AL,'Q'
                JZ      QUIT            ;if quit requested

                CMP     AL,CC_CR        ;see if just a return was pressed
                JZ      CRONLY          ;if return only

                CMP     AL,'E'
                JZ      PEJECT          ;if a page eject wanted

                CMP     AL,'I'
                JZ      INIT            ;if initialize printer requested

                CMP     AL,'B'
                JZ      CBUF            ;clear printer buffer

                CMP     AL,'S'
                MOV     BX,OFFSET SETM  ;preset for "set" request
                JZ      P4              ;if "set" requested

                CMP     AL,'C'
                MOV     BX,OFFSET CLRM
                JZ      P4              ;if "clear"
```

→

```
;               Request bad...inform user....

ERR:
                MOV     DX,OFFSET ILLREQ

ERR2:
                MOV     AH,DOSF_OUTSTR
                INT     DOSI_FUNC       ;inform user of problem

;               Delay a short while then clear error message...

                MOV     BL,3            ;set outer loop ctr

DELAY:
                XOR     AX,AX

DELAY2:
                DEC     AX
                JNZ     DELAY2

                DEC     BL
                JNZ     DELAY

                JMP     LOOP            ;try again

;               Two-character request... get 2nd char and process
;               request...

P4:
                PUSH    BX              ;save msg pointer table addr
                MOV     AH,DOSF_CONIN
                INT     DOSI_FUNC       ;get 2nd input char
                CMP     AL,'8'          ;handle this char special
                JZ      P8              ;if an 8

                AND     AL,5FH          ;allow both upper/lower case
                MOV     BL,AL           ;save input char
                MOV     SI, OFFSET CTRC ;FWA of legal character table
                MOV     CX,LCTRC        ;number of chars to check
                XOR     DL,DL           ;relative position counter

P6:
                LODSB                   ;get a legal char from table
                CMP     AL,BL           ;compare with input char
                JZ      P8              ;if a match

                INC     DL              ;incr relative position counter
                LOOP    P6              ;loop until finished with all chars

;               Char inputted not in table...
;               Inform user of bad input...

                POP     BX              ;clear stack
                JMP     SHORT ERR       ;inform user of error and try again

;               Request legal...

P8:
                POP     BX              ;restore pointer table addr
                XOR     DH,DH
                SHL     DX,1            ;*2
                MOV     SI,DX           ;offset into table
                MOV     BX,[BX+SI]      ;addr of printer function sequence
                CALL    PRTSTR          ;send request to printer
                JMP     LOOP            ;go back for another request

;               Initialize printer...clear all functions that can be
;               set by this program...

INIT:
                MOV     BX,OFFSET IMSG
                CALL    PRTSTR          ;initialize printer
                JMP     LOOP            ;ask for another request

;               Clear printer buffer of any characters not printer yet...

CBUF:
                MOV     BX,OFFSET CBMSG

CBUF2:
                CALL    PRTSTR          ;send function to printer
                JMP     LOOP            ;see if there are any more requests

;               Page eject...start a new page...

PEJECT:
                MOV     BX,OFFSET EJMSG
                JMP     CBUF2
```

→

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(such as clearing the screen, selecting colors, positioning the cursor, etc.). This is the approach used by the IBM PC. This approach, though, won't be used by SPF; instead, an alternative method will be used.

Both PC-DOS and MS-DOS 2 provide a device driver that makes the screen functions easier to use. The device driver, ANSI.SYS, follows the American National Standards Institute standard control sequences for screen functions. The SPF utility for the IBM-PC compatibles uses the ANSI.SYS device driver. This means that the driver must be on the system disk, and the CONFIG.SYS file must also be there, containing the following entry:

DEVICE = ANSI.SYS

After entering the source code into an .ASM file, use the commands in Figure 2 to assemble the code and generate an executable module (.COM file). In Figure 2, it is assumed that the system disk containing the assembler, loader, etc., is in drive A:, and the source code is in drive B:.

File <FNAME>.COM (you can call it SP, SPF, or whatever you desire) will contain the executable utility. File <FNAME>.LST will contain an assembly language listing, and <FNAME>.REF will contain the cross-reference listing.

Please note that the assembly language listing requires 132 columns. This is where this SPF utility comes in mighty handy to set the FX-80 to condensed printing, which can print up to 132 columns on 8½"-wide paper.

SPF's structure

Now let me talk a little about the structure of the SPF utility itself.

From the user's viewpoint, the program is basically rather simple. It is, likewise, rather simple from the programmer's viewpoint.

SPF starts out by clearing the screen. It then puts up the menu-selection page—using DOSF_OUTSTR, MS-DOS's function for displaying information on the screen. The information sent to the screen contains the control sequences to clear the screen and position the cursor.

Next there is a loop, the heart of the utility; this continually reads requests from the keyboard and processes them until the Q command (quit) is entered.

The loop first displays the ?? prompt, again using the MS-DOS function DOSF_OUTSTR. (At the same time, the loop makes sure that there is no error message or any other information on this prompt line.)

Using the DOSF_CONIN function, the utility next waits for keyboard input (either a one-character or two-character request). After the first character is entered, SPF checks to see whether it is a one-character request, the first character of a two-character request, or an illegal character. If it is an illegal request, an

```
;               CR (RETURN) key only...error...

CRONLY:
                JMP     LOOP            ;ignore just a CR

;               Quit...exit....program...

QUIT:
                MOV     DX,OFFSET CLEAR
                MOV     AH,DOSF_OUTSTR
                INT     DOSI_FUNC

                INT     DOSI_TERM       ;return to Z-DOS/MS-DOS

                SUBTTL  Subroutines...
                PAGE

;***************************************
;
;       PRTSTR - Print Text String on Printer
;
;       ON ENTRY:       BX - Offset of String to Print
;
PRTSTR:
                MOV     DL,BYTE PTR[BX] ;get a char from string
                CMP     DL,'$'
                JZ      PRTSTRE         ;if end-of-string

                PUSH    BX
                MOV     AH,DOSF_PRINTOUT
                INT     DOSI_FUNC       ;print out the char
                POP     BX
                INC     BX              ;advance to next char in string
                JMP     PRTSTR          ;go back for next char

PRTSTRE:
                RET                     ;exit

                SUBTTL  DATA Storage, Messages, Function Strings, etc...
                PAGE

SETM            DW      SCMSG,SXMSG,SMMSG,SPMSG,SDMSG,SEMSG
                DW      SSMSG,S8MSG,SLMSG
CLRM            DW      CCMSG,CXMSG,CMMSG,CPMSG,CDMSG,SEMSG
                DW      CSMSG,S6MSG,CLMSG
SCMSG           DB      15,'$'          ;set condensed mode
CCMSG           DB      18,'$'          ;clear condensed mode
SXMSG           DB      CC_ESC,'W',1,'$' ;set enlarged mode
CXMSG           DB      CC_ESC,'W',Ø,'$' ;clear enlarged mode
SDMSG           DB      CC_ESC,'G$'     ;set double strike mode
CDMSG           DB      CC_ESC,'H$'     ;clear double strike
SMMSG           DB      CC_ESC,'E$'     ;set emphasized mode
CMMSG           DB      CC_ESC,'F$'     ;clear emphasized
SEMSG           DB      CC_ESC,'M$'     ;set elite characters
CEMSG           DB      CC_ESC,'P$'     ;clear elite - set pica
SPMSG           DB      CC_ESC,'p',1,'$' ;select proportional printing
CPMSG           DB      CC_ESC,'p',Ø,'$' ;clear proportional printing
SSMSG           DB      CC_ESC,'N$'     ;skip over perforations
CSMSG           DB      CC_ESC,'O$'     ;clear skip
S8MSG           DB      CC_ESC,'Ø$'     ;select 8 LPI
S6MSG           DB      CC_ESC,'2$'     ;select 6 LPI
SLMSG           DB      CC_ESC,'l',2,'$' ;start left margin in column 3
CLMSG           DB      CC_ESC,'l',Ø,'$' ;reset left margin to Ø
CBMSG           DB      24,'$'          ;clear printer buffer
EJMSG           DB      12,'$'          ;page eject
IMSG            DB      CC_ESC,'@$'     ;initialize printer
;
CTRC            DB      'CXMPDE'        ;legal requests
                DB      'S8L'
LCTRC           =       $-CTRC
                IF      ZFLAG EQ Ø
MENMSG          DB      CC_ESC,'E'      ;Clear screen
                ELSE
MENMSG          DB      CC_ESC,'[2J'
                ENDIF
                DB      'SPF - SET PRINTER (EPSON) CONTROL FUNCTIONS...'
                DB      CC_LF,CC_CR
                DB      'Copyright (C) 1984 Richard L. Mueller, Ph.D.'
                DB      CC_LF,CC_CR,CC_LF
                DB      'Print Modes:'
                DB      CC_LF,CC_CR
                DB      '  SC / CC   -   Set / Clear Condensed Printing'
                DB      CC_LF,CC_CR
                DB      '  SX / CX   -   Set / Clear Enlarged Printing'
                DB      CC_LF,CC_CR
                DB      '  SM / CM   -   Set / Clear Emphasized Printing'
                DB      CC_LF,CC_CR
                DB      '  SP / CP   -   Set / Clear Proportional Printing'
```

→

```
                DB      CC_LF,CC_CR
                DB      '  SD / CD   -   Set / Clear Double Strike Printing'
                DB      CC_LF,CC_CR
                DB      '  SE / CE   -   Set Elite Chars / Clear = Set Pica'
                DB      ' Chars'
                DB      CC_LF,CC_CR,CC_LF
                DB      'Paper Functions:'
                DB      CC_LF,CC_CR
                DB      '  SS / CS   -   Set / Clear Skip over Paper '
                DB      'Perforations'
                DB      CC_LF,CC_CR
                DB      '  S8 / C8   -   Set 8 LPI / Clear = 6 LPI'
                DB      CC_LF,CC_CR
                DB      '  SL / CL   -   Set Left Margin Over 2 Columns / '
                DB      'Clear = Reset Left Margin'
                DB      CC_LF,CC_CR,CC_LF
                DB      'MISC. Functions:',CC_LF,CC_CR
                DB      '  B         -   Clear Printer Buffer'
                DB      CC_LF,CC_CR
                DB      '  E         -   Eject Paper - New Page',CC_LF,CC_CR
                DB      '  I         -   Initialize Printer'
                DB      CC_LF,CC_CR
                IF      ZFLAG EQ Ø
                DB      '  Q         -   Quit - Return to Z-DOS/MS-DOS'
                ELSE
                DB      '  Q         -   Quit - Return to MS-DOS'
                ENDIF
                DB      CC_CR,'$'
                IF      ZFLAG EQ Ø
IREQ            DB      CC_ESC,'Y',(31+24),(31+1),CC_ESC,'l ??  $'
ILLREQ          DB      CC_ESC,'Y',(31+24),(31+8)
                DB      '  Illegal Request...Try Again....$'
CLEAR           DB      CC_ESC,'E$'
                ELSE
IREQ            DB      CC_ESC,'[24;Ø1H'
                DB      CC_ESC,'[K',CC_CR
                DB      ' ??  $'
ILLREQ          DB      CC_ESC,'[24;Ø8H'
                DB      '  Illegal Request...Try Again....$'
CLEAR           DB      CC_ESC,'[2J$'
                ENDIF
SPF             ENDS
                END     START
```

error message is displayed, as stated above; on return to the start of the loop, the error message is cleared.

The program checks for one-character requests in-line—first for a RETURN by itself, then for an "E" for page eject, etc. If the request is a one-character request, it is processed immediately. If not, and the first character is an "S", a check is made for a two-character request by comparing the second character with the contents of the CTRC table.

If a match is not found, an illegal request has been made, and processing for errors continues as above.

If a match *is* found for the request, a particular printer escape sequence to perform the requested function is sent to the printer via the MS-DOS function DOSF_PRINTOUT. Then SPF goes back to the start of the main loop to wait for another input request—possibly the request to quit.

The last part of the SPF code contains the control sequences—starting at SCMSG for "set condensed printing mode." After that section, you can see the two-character request table at CTRC. Finally, there is the menu text as well as error messages.

In the text area, you will see the IF. . . ELSE. . . ENDIF sequence in a few places. This allows the code to be assembled either for the H/Z100 or the IBM-PC compatibles.

That covers the description of the Z-DOS/MS-DOS version of the SPF utility package. Next, I would like to dis-

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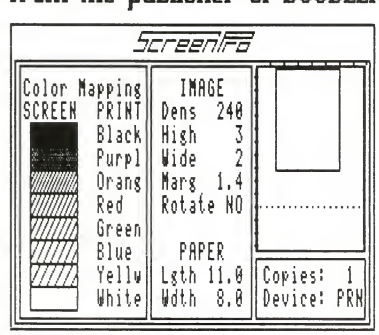

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cuss the CP/M-86 version. Remember that all the versions of the SPF utility package are basically the same in structure—both from the end-user's view and from the programmer's view.

CP/M-86

The CP/M-86 version of SPF is given in Listing 2. As noted, the operation of the CP/M-86 version is the same as the Z-DOS/MS-DOS version.

Internally, the structure of the two versions is also basically the same. There are, however, some differences in structure because the Digital Research assembler ASM-86 is used here instead of Microsoft's MASM. Most of the instruction mnemonics and instruction formats are the same. However, there are differences in some of the mnemonics, as well as in assembler instructions and directives.

The main assembler instruction/directive difference is in the SEGMENT instructions. The MASM assembler uses the following sequence:

```
<SEGNAME> SEGMENT
ASSUME
ORG
.
<CODE>/<DATA>
.
<SEGNAME> ENDS
```

The ASM-86 assembler uses:

```
CSEG
ORG
.
<CODE>
.
DSEG
.
<DATA>
.
```

In addition to these, there are other assembler differences. One is the "short jump" instruction mnemonic: MASM uses JMP SHORT <LABEL>, while the ASM-86 assembler uses JMPS <LABEL>. Compare the source code of the two versions to see

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```
B:
A:MASM <FNAME>.ASM,<FNAME>.OBJ,<FNAME>.LST,<FNAME>.CRF
A:CREF <FNAME>.CRF,<FNAME>.REF
A:LINK <FNAME>.OBJ;
A:EXE2BIN <FNAME>.EXE,<FNAME>.COM
DEL <FNAME>.OBJ
DEL <FNAME>.EXE
DEL <FNAME>.CRF
```

Figure 2. These command lines will assemble SPF.ASM (Listing 1) to produce an executable .COM file. LINK generates an .EXE file which EXE2BIN must change to a .COM file. <FNAME> may be whatever file name you wish to assign to SPF.ASM and the resulting files. (This figure assumes that the default drive—B:—will hold the source and resulting files.)

Listing 2. SPF.A86 is the version of SPF for the CP/M-86 operating system. Its operation is identical to that of the Z-DOS/MS-DOS version (Listing 1) and the CP/M-85 version (Listing 4). As given here, SPF.A86 can be assembled to run on a Z100. A small modification in the last few lines will enable the program to be assembled for use on a Z150 or other IBM compatible. (See Listing 3.)

```
                TITLE   'SPF - Set (EPSON) Printer Functions'
                PAGEWIDTH 132

;               Set various printer functions for the Epson printer
;               such as character size, left margin, form feed, etc.

;               CP/M-86 Version (8086/8088 Code).

;               Program is MENU driven for ease of use....

;               Copyright (C) 1984 Richard L. Mueller, Ph.D.

;               30 September 84.

;               Defines....

CPMBUF          EQU     80H             ;start of input buffer
CPMF_TERM       EQU     0               ;terminate - return to CP/M-86
CPMF_CONIN      EQU     1               ;console input
CPMF_PRINTOUT   EQU     5               ;print a char
CPMF_OUTSTR     EQU     9               ;display string to $
CPMI_FUNC       EQU     224             ;CP/M-86 function interrupt

CC_ESC          EQU     1BH             ;escape char
CC_CR           EQU     0DH             ;CR
CC_LF           EQU     0AH             ;line feed
CC_EOF          EQU     1AH             ;end-of-file

                CSEG
                ORG     100H            ;start of TPA
START:
                JMPS    BEGIN           ;jump around copyright info

                DB      'Copyright (C) 1984 Richard L. Mueller, Ph.D.'

BEGIN:
                MOV     DX,OFFSET MENMSG
                MOV     CL,CPMF_OUTSTR
                INT     CPMI_FUNC       ;display menu

LOOP:
                MOV     DX,OFFSET IREQ  ;request input msg
                MOV     CL,CPMF_OUTSTR
                INT     CPMI_FUNC

                MOV     CL,CPMF_CONIN   ;console input request
                INT     CPMI_FUNC       ;get 1st char of request
                AND     AL,5FH          ;allow both upper and lower case
                CMP     AL,'Q'
                JZ      QUIT            ;if quit requested

                CMP     AL,CC_CR        ;see if just a return was pressed
                JZ      CRONLY          ;if return only

                CMP     AL,'E'
                JZ      PEJECT          ;if a page eject wanted

                CMP     AL,'I'
                JZ      INIT            ;if initialize printer requested
```

→

```
                CMP     AL,'C'
                MOV     BX,OFFSET CLRM
                JZ      P4              ;if "clear"

;               Request bad...inform user....

ERR:
                MOV     DX,OFFSET ILLREQ

ERR2:
                MOV     CL,CPMF_OUTSTR
                INT     CPMI_FUNC       ;inform user of problem

;               Delay a short while then clear error message...

                MOV     BL,3            ;set outer loop ctr

DELAY:
                XOR     AX,AX

DELAY2:
                DEC     AX
                JNZ     DELAY2

                DEC     BL
                JNZ     DELAY

                JMP     LOOP            ;try again

;               Two-character request... get 2nd char and process
;               request...

P4:
                PUSH    BX              ;save msg pointer table addr
                MOV     CL,CPMF_CONIN
                INT     CPMI_FUNC       ;get 2nd input char
                CMP     AL,'8'          ;handle this char special
                JZ      P8              ;if an 8

                AND     AL,5FH          ;allow both upper/lower case
                MOV     BL,AL           ;save input char
                MOV     SI, OFFSET CTRC ;FWA of legal character table
                MOV     CX,LCTRC        ;number of chars to check
                XOR     DL,DL           ;relative position counter

P6:
                LODSB                   ;get a legal char from table
                CMP     AL,BL           ;compare with input char
                JZ      P8              ;if a match

                INC     DL              ;incr relative position counter
                LOOP    P6              ;loop until finished with all chars


;               Char inputted not in table...
;               Inform user of bad input...

                POP     BX              ;clear stack
                JMPS    ERR             ;inform user of error and try again

;               Request legal...

P8:
                POP     BX              ;restore pointer table addr
                XOR     DH,DH
                SHL     DX,1            ;*2
                MOV     SI,DX           ;offset into table
                MOV     BX,[BX+SI]      ;addr of printer function sequence
                CALL    PRTSTR          ;send request to printer
                JMP     LOOP            ;go back for another request

;               Initialize printer...clear all functions that can be
;               set by this program...

INIT:
                MOV     BX,OFFSET IMSG
                CALL    PRTSTR          ;initialize printer
                JMP     LOOP            ;ask for another request

;               Clear printer buffer of any characters not printer yet...

CBUF:
                MOV     BX,OFFSET CBMSG
```

➔

what other assembler differences you can find.

Another area that is different between the Z-DOS/MS-DOS and CP/M-86 versions is in the area of system functions and the registers used in the calling sequence of those functions. To keep the source code similar, I defined the function names to be similar, such as DOSF_CONIN and CPMF_CONIN, DOSF_OUTSTR and CPMF_OUTSTR, and so on.

Installing this version of the SPF utility is very similar to installing the Z-DOS/MS-DOS version. First, enter the source code into an .A86 file using your favorite editor (perhaps the Digital Research character-file editor ED). Next, enter the sequence of commands found in Figure 3. (The assembler and loader are assumed to be on drive A:, and the .A86 file is assumed to be on drive B:.)

In the last two commands in Figure 3, please note that if the referenced <FNAME> file is on the non-default disk drive, then the drive residency must be specified with the command (e.g., B:GENCMD).

As with the Z-DOS/MS-DOS version, <FNAME> can be any name you desire, such as SPF, SP, etc. After the .CMD file is generated, the SPF utility can be called by entering <FNAME>.

The same selection menu is displayed as shown in Figure 1. There is only one small difference in the menu, and that is in the Quit request. The return here is to

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"CP/M-86", rather than "MS-DOS", for the IBM-compatibles version, and to "Z-DOS/MS-DOS" for the H/Z100 version. The selections are made as before.

CP/M-86 on the '150

Recently I purchased the IBM-PC version of CP/M-86 for my Z160, and I converted my H/Z100 CP/M-86 version to run on the Z160. The only difference between the two versions is in the escape sequences used for screen control. That works out to a difference in only the last four lines of Listing 2. The lines used in the IBM-compatible CP/M-86 version are given in Listing 3.

There is one difference in assembling the IBM CP/M-86 version. On the command line for ASM, you must have a $FI to tell the assembler to generate Intel hex format—which is required by GENCMD. The default is Digital Research hex format, so the parameter must be specified.

In Figure 3, the first line would then be:

ASM <FNAME>.A86 $FI Ad Hd Pd Sd

CP/M-85

Finally, I would like to cover the CP/M-85 version for the H/Z100 microcomputer. As with the other versions, the source code is included with this article for your use. See Listing 4.

From the end-user's view, once again, the menu-selection page is the same as the other versions discussed above—except the last line, which states that a

```
CBUF2:
                CALL    PRTSTR          ;send function to printer
                JMP     LOOP            ;see if there are any more requests

;               Page eject...start a new page...

PEJECT:
                MOV     BX,OFFSET EJMSG
                JMP     CBUF2

;               CR (RETURN) key only...error...

CRONLY:
                JMP     LOOP            ;ignore just a CR

;               Quit...exit....program...

QUIT:
                MOV     DX,OFFSET CLEAR
                MOV     CL,CPMF_OUTSTR
                INT     CPMI_FUNC
                MOV     CL,CPMF_TERM
                INT     CPMI_FUNC       ;return to CP/M-86

                EJECT

;               Subroutines...

;*****************************************
;
;       PRTSTR - Print Text String on Printer
;
;       ON ENTRY:       BX - Offset of String to Print
;
PRTSTR:
                MOV     DL,BYTE PTR[BX] ;get a char from string
                CMP     DL,'$'
                JZ      PRTSTRE         ;if end-of-string

                PUSH    BX
                MOV     CL,CPMF_PRINTOUT
                INT     CPMI_FUNC       ;print out the char
                POP     BX
                INC     BX              ;advance to next char in string
                JMP     PRTSTR          ;go back for next char

PRTSTRE:
                RET                     ;exit
END_OF_CODE     EQU     $               ;LWA+1 of Code Segment

                EJECT
                DSEG
                ORG     OFFSET END_OF_CODE ;start of Data Segment

;               Data storage and messages...

SETM            DW      SCMSG,SXMSG,SMMSG,SPMSG,SDMSG,SEMSG
                DW      SSMSG,S8MSG,SLMSG
CLRM            DW      CCMSG,CXMSG,CMMSG,CPMSG,CDMSG,SEMSG
                DW      CSMSG,S6MSG,CLMSG
SCMSG           DB      15,'$'          ;set condensed mode
CCMSG           DB      18,'$'          ;clear condensed mode
SXMSG           DB      CC_ESC,'W',1,'$' ;set enlarged mode
CXMSG           DB      CC_ESC,'W',0,'$' ;clear enlarged mode
SDMSG           DB      CC_ESC,'G$'     ;set double strike mode
CDMSG           DB      CC_ESC,'H$'     ;clear double strike
SMMSG           DB      CC_ESC,'E$'     ;set emphasized mode
CMMSG           DB      CC_ESC,'F$'     ;clear emphasized
SEMSG           DB      CC_ESC,'M$'     ;set elite characters
CEMSG           DB      CC_ESC,'P$'     ;clear elite - set pica
SPMSG           DB      CC_ESC,'p',1,'$' ;select proportional printing
CPMSG           DB      CC_ESC,'p',0,'$' ;clear proportional printing
SSMSG           DB      CC_ESC,'N$'     ;skip over perforations
CSMSG           DB      CC_ESC,'O$'     ;clear skip
S8MSG           DB      CC_ESC,'0$'     ;select 8 LPI
S6MSG           DB      CC_ESC,'2$'     ;select 6 LPI
SLMSG           DB      CC_ESC,'l',2,'$' ;start left margin in column 3
CLMSG           DB      CC_ESC,'l',0,'$' ;reset left margin to 0
CBMSG           DB      24,'$'          ;clear printer buffer
EJMSG           DB      12,'$'          ;page eject
IMSG            DB      CC_ESC,'@$'     ;initialize printer
;
SCTRC           EQU     OFFSET $
CTRC            DB      'CXMPDE'        ;legal requests
                DB      'S8L'
```


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```
EQU     OFFSET $-SCTRC
DB      CC_ESC,'E'      ;Clear screen
DB      'SPF - SET PRINTER (EPSON) CONTROL FUNCTIONS...'
DB      CC_LF,CC_CR
DB      'Copyright (C) 1984 Richard L. Mueller, Ph.D.'
DB      CC_LF,CC_CR,CC_LF
DB      'Print Modes:'
DB      CC_LF,CC_CR
DB      '  SC / CC   -   Set / Clear Condensed Printing'
DB      CC_LF,CC_CR
DB      '  SX / CX   -   Set / Clear Enlarged Printing'
DB      CC_LF,CC_CR
DB      '  SM / CM   -   Set / Clear Emphasized Printing'
DB      CC_LF,CC_CR
DB      '  SP / CP   -   Set / Clear Proportional Printing'
DB      CC_LF,CC_CR
DB      '  SD / CD   -   Set / Clear Double Strike Printing'
DB      CC_LF,CC_CR
DB      '  SE / CE   -   Set Elite Chars / Clear = Set Pica'
DB      ' Chars'
DB      CC_LF,CC_CR,CC_LF
DB      'Paper Functions:'
DB      CC_LF,CC_CR
DB      '  SS / CS   -   Set / Clear Skip over Paper '
DB      'Perforations'
DB      CC_LF,CC_CR
DB      '  S8 / C8   -   Set 8 LPI / Clear = 6 LPI'
DB      CC_LF,CC_CR
DB      '  SL / CL   -   Set Left Margin Over 2 Columns / '
DB      'Clear = Reset Left Margin'
DB      CC_LF,CC_CR,CC_LF
DB      'MISC. Functions:',CC_LF,CC_CR
DB      '  B         -   Clear Printer Buffer'
DB      CC_LF,CC_CR
DB      '  E         -   Eject Paper - New Page',CC_LF,CC_CR
DB      '  I         -   Initialize Printer'
DB      CC_LF,CC_CR
DB      '  Q         -   Quit - Return to CP/M-86'
DB      CC_CR,'$'
DB      CC_ESC,'Y',(31+24),(31+1),CC_ESC,'l ??  $'
DB      CC_ESC,'Y',(31+24),(31+8)
DB      '  Illegal Request...Try Again....$'
DB      CC_ESC,'E$'
END
```

```
ASM <FNAME>.A86 $Ad Hd Pd Sd
GENCMD <FNAME>.H86 (8Ø8Ø)
ERA <FNAME>.H86

Here, Ad refers to the drive on which the source file (.A86) is resident.
      Hd refers to the residency of the HEX file (.H86).
      Pd refers to the residency of the list file (.LST).
      Sd refers to the residency of the symbol file (.SYM).
Output may be to disk devices A: through P: or to:
      X - listing to console screen;
      Y - listing directly to printer;
      Z - listing to the "bit bucket" -- in other words, thrown away.
```

Figure 3. These three commands will assemble SPF.A86 (Listing 2) to produce an executable form. The executable version (<FNAME>.CMD) is generated by GENCMD.

```
IREQ            DB      CC_ESC,'Y',(31+24),(31+1)
                DB      CC_ESC,'K',CC_ESC,'s ??  ',CC_ESC,'t$
ILLREQ          DB      CC_ESC,'Y',(31+24),(31+8)
                DB      CC_ESC,'s  Illegal Request...Try Again....'
                DB      CC_ESC,'t$
CLEAR           DB      CC_ESC,'E$'
                END
```

Listing 3. These lines may be substituted for the last five lines of SPF.A86, in Listing 2. Doing so will enable SPF to run under CP/M-86 on a Z150 or other IBM compatible.

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return is made to "CP/M-85" upon the Q request.

The structure of the source code is similar to the other versions, except that this version is written in 8080/8085 assembly language rather than in 8086/8088 assembly language. Because of some of the limitations in the 8080/8085 assemblers, I could not define the system function calls the same way that I did for the CP/M-86 system functions. However, I did try to name the function calls in a meaningful way.

Installation of the CP/M-85 SPF utility is similar to the other versions discussed above. Enter the source code into an .ASM file again using your favorite editor. Then enter the sequence of commands given in Figure 4 or 5. (The assembler and loader are assumed to be on drive A:, and the source code file is assumed to be on drive B:.)

Please note that any 8080/8085 assembler can be used, and that includes Digital Research's MAC assembler, which I

Listing 4. SPF.ASM for the CP/M-85 operating system on the Z100. Its operation is identical to that of the Z-DOS/MS-DOS version (Listing 1) and the CP/M-86 version (Listing 2), and its structure is quite similar.

```
                TITLE   'SPF - Set (EPSON) Printer Functions'
;
;               Set various printer functions for the Epson printer
;               such as character size, left margin, form feed, etc.
;
;               CP/M-85 Version (8080 Code).
;
;               Program is MENU driven for ease of use....
;
;               Copyright (C) 1984 Richard L. Mueller, Ph.D.
;
;               22 September 84
;
;               Defines....
;
BOOT            EQU     0               ;exit to CP/M-85
CPMKBD          EQU     1               ;console keyboard input
CPMCRT          EQU     2               ;console output
CPMLST          EQU     5               ;printer output
CPMBUF          EQU     80H             ;start of input buffer
CPMI            EQU     5               ;BDOS entry point
ESC             EQU     1BH             ;escape char
CR              EQU     0DH             ;CR
LF              EQU     0AH             ;Line Feed
;
;
                ORG     100H            ;start of TPA
START:          DS      0
                JMP     BEGIN           ;jump around copyright info
;
                DB      'Copyright (C) 1984 Richard L. Mueller, Ph.D.'
;
BEGIN:          DS      0
                LXI     H,0
                DAD     SP              ;get entry stack pointer
                SHLD    OLDSP           ;save it
                LXI     SP,STACK        ;reset to our stack
;
                LXI     H,MENMSG
                CALL    DSPSTR          ;put up request options
;
LOOP:           DS      0
                LXI     H,IREQ          ;request input
                CALL    DSPSTR
                CALL    RDCHR           ;get 1st char of request
                CPI     'Q'
                JZ      QUIT            ;if quit requested
;
                CPI     CR              ;chk if just a RETURN presses
                JZ      CRONLY          ;if return only
;
                CPI     'E'
                JZ      EJECT           ;if a page eject wanted
;
                CPI     'I'
                JZ      INIT            ;if initialize printer requested
;
                CPI     'B'
                JZ      CBUF            ;clear printer buffer
;
                CPI     'S'
                LXI     H,SETM          ;preset for "set" request
                JZ      P4              ;if "set" requested
;
                CPI     'C'
                LXI     H,CLRM          ;preset for clear
                JZ      P4              ;if "clear"
;
;
;               Request bad...inform user....
;
ERR:            DS      0
                LXI     H,ILLREQ
;
ERR2:           DS      0
                CALL    DSPSTR
;
;               Delay a short while then clear error message...
;
                MVI     C,5
;
DELAY:          DS      0
                MVI     B,0
;
DELAY2:         DS      0
                XRA     A
```

→

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```
;
DELAY4:         DCR     A
                JNZ     DELAY4
;
                DCR     B
                JNZ     DELAY2
;
                DCR     C
                JNZ     DELAY
;
                JMP     LOOP            ;try again
;
;
;               Two-character request... get 2nd char and process
;               request...
;
P4:             DS      Ø
                PUSH    H               ;save msg pointer table addr
                CALL    RDCHR           ;get second char of request
                LXI     H,CTRC          ;list of legal 2nd chars
                MVI     B,Ø
                MVI     C,LCTRC
;
P6:             DS      Ø
                MOV     D,M             ;get a legal char from table
                CMP     D               ;compare with input
                JZ      P8              ;if compares
;
                INR     B
                INX     H
                DCR     C               ;decr # of legal chars
                JNZ     P6              ;if more to check
;
;               Char inputted not in table...
;               Inform user of bad input...
;
                POP     H               ;clear stack
                JMP     ERR             ;inform user of error and try again
;
;
;               Request legal...
;
P8:             DS      Ø
                POP     H               ;restore msg pointer table addr
                MOV     A,B             ;get index of msg
                RLC                     ;*2
                MOV     E,A
                MVI     D,Ø
                DAD     D               ;table addr of proper msg addr
                MOV     E,M             ;get msg addr
                INX     H
                MOV     D,M
                XCHG
                CALL    PRTSTR          ;send request to printer
                JMP     LOOP            ;go back for another request
;
;
;               Initialize printer...clear all functions that can be
;               set by this program...
;
INIT:           DS      Ø
                LXI     H,IMSG
                CALL    PRTSTR          ;initialize printer
                JMP     LOOP            ;ask for another request
;
;
;               Clear printer buffer of any characters not printed yet...
;
CBUF:           DS      Ø
                LXI     H,CBMSG
;
CBUF2:          DS      Ø
                CALL    PRTSTR          ;send function to printer
                JMP     LOOP            ;see if there are any more requests
;
;
;               Page eject...start a new page...
;
EJECT:          DS      Ø
                LXI     H,EJMSG
                JMP     CBUF2
;
;
;               CR (RETURN) key only...error...
;
CRONLY:         DS      Ø
                JMP     LOOP            ;ignore just a CR
;
;
;               Quit...exit....program...
QUIT:           DS      Ø
                LXI     H,CLEAR
                CALL    DSPSTR          ;clear screen
                LHLD    OLDSP           ;restore entry SP
```

→

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Circle #240 on Reader Service Card


```
                SPHL
                JMP     BOOT            ;return to CP/M-85
;
;
                PAGE
;
;
;               Subroutines...
;
;*****************************************
;
;       DSPSTR - Display Text String on CRT
;
;       ON ENTRY:       HL - FWA of String which is terminated with $
;
DSPSTR:         DS      Ø
                MOV     A,M             ;get a char from string
                CPI     '$'             ;check for end of string
                RZ                      ;exit if end
;
                MOV     E,A
                PUSH    H               ;save string addr
                MVI     C,CPMCRT        ;display function
                CALL    CPMI            ;display char
                POP     H               ;restore string addr
                INX     H               ;move to next char
                JMP     DSPSTR
;
;
;*****************************************
;
;       PRTSTR - Print Text String on Printer
;
;       ON ENTRY:       HL - FWA of string terminated with $
;
PRTSTR:         DS      Ø
                MOV     A,M             ;get a char from string
                CPI     '$'             ;check for end of string
                RZ                      ;exit if end
;
                MOV     E,A
                PUSH    H               ;save string addr
                MVI     C,CPMLST        ;printer function
                CALL    CPMI            ;print char
                POP     H               ;restore string addr
                INX     H               ;incr to next char
                JMP     PRTSTR
;
;
;*****************************************
;
;       RDCHR - Read a Character from Keyboard
;
;       ON EXIT:        A - input character
;
RDCHR:          DS      Ø
                MVI     C,CPMKBD        ;console input function
                CALL    CPMI            ;get a char
                CPI     '8'             ;special handle this input
                RZ                      ;exit if an 8
;
                ANI     5FH             ;allow both upper and lower case
                RET                     ;exit
;
;
                PAGE
;
;               Data storage and messages...
;
OLDSP:          DW      Ø               ;save entry SP
;
SETM:           DW      SCMSG,SXMSG,SMMSG,SPMSG,SDMSG,SEMSG
                DW      SSMSG,S8MSG,SLMSG
CLRM:           DW      CCMSG,CXMSG,CMMSG,CPMSG,CDMSG,SEMSG
                DW      CSMSG,S6MSG,CLMSG
SCMSG:          DB      15,'$'          ;set condensed mode
CCMSG:          DB      18,'$'          ;clear condensed mode
SXMSG:          DB      ESC,'W',1,'$'   ;set enlarged mode
CXMSG:          DB      ESC,'W',Ø,'$'   ;clear enlarged mode
SDMSG:          DB      ESC,'G$'        ;set double strike mode
CDMSG:          DB      ESC,'H$'        ;clear double strike
SMMSG:          DB      ESC,'E$'        ;set emphasized mode
CMMSG:          DB      ESC,'F$'        ;clear emphasized
SEMSG:          DB      ESC,'M$'        ;set elite characters
CEMSG:          DB      ESC,'P$'        ;clear elite - set pica
SPMSG:          DB      ESC,'p',1,'$'   ;select proportional printing
CPMSG:          DB      ESC,'p',Ø,'$'   ;clear proportional printing
SSMSG:          DB      ESC,'N$'        ;skip over perforations
CSMSG:          DB      ESC,'O$'        ;clear skip
S8MSG:          DB      ESC,'Ø$'        ;select 8 LPI
S6MSG:          DB      ESC,'2$'        ;select 6 LPI
SLMSG:          DB      ESC,'l',2,'$'   ;start left margin in column 3
CLMSG:          DB      ESC,'l',Ø,'$'   ;reset left margin to Ø
CBMSG:          DB      24,'$'          ;clear printer buffer
EJMSG:          DB      12,'$'          ;page eject
```

```
IMSG:           DB      ESC,'@$'        ;initialize printer
;
CTRC:           DB      'CXMPDE'        ;legal requests
                DB      'S8L'
LCTRC           EQU     $-CTRC
MENMSG:         DB      ESC,'E'         ;Clear screen
                DB      'SPF - SET PRINTER (EPSON) CONTROL FUNCTIONS...'
                DB      LF,CR
                DB      'Copyright (C) 1984 Richard L. Mueller, Ph.D.'
                DB      LF,CR,LF
                DB      'Print Modes:'
                DB      LF,CR
                DB      '  SC / CC   -   Set / Clear Condensed Printing'
                DB      LF,CR
                DB      '  SX / CX   -   Set / Clear Enlarged Printing'
                DB      LF,CR
                DB      '  SM / CM   -   Set / Clear Emphasized Printing'
                DB      LF,CR
                DB      '  SP / CP   -   Set / Clear Proportional Printing'
                DB      LF,CR
                DB      '  SD / CD   -   Set / Clear Double Strike Printing'
                DB      LF,CR
                DB      '  SE / CE   -   Set Elite Chars / Clear = Set Pica'
                DB      ' Chars'
                DB      LF,CR,LF
                DB      'Paper Functions:'
                DB      LF,CR
                DB      '  SS / CS   -   Set / Clear Skip over Paper '
                DB      'Perforations'
                DB      LF,CR
                DB      '  S8 / C8   -   Set 8 LPI / Clear = 6 LPI'
                DB      LF,CR
                DB      '  SL / CL   -   Set Left Margin Over 2 Columns / '
                DB      'Clear = Reset Left Margin'
                DB      LF,CR,LF
                DB      'MISC. Functions:',LF,CR
                DB      '  B         -   Clear Printer Buffer'
                DB      LF,CR
                DB      '  E         -   Eject Paper - New Page',LF,CR
                DB      '  I         -   Initialize Printer'
                DB      LF,CR
                DB      '  Q         -   Quit - Return to CP/M-85'
                DB      CR,'$'
IREQ:           DB      ESC,'Y',(31+24),(31+1),ESC,'1 ??  $'
ILLREQ:         DB      ESC,'Y',(31+24),(31+8)
                DB      '  Illegal Request...Try Again....$'
CLEAR:          DB      ESC,'E$'
;
                DS      120             ;Stack
STACK           DS      1
                END     START
```

```
ASM <FNAME>.<A><B><C>
LOAD <FNAME>.HEX
ERA <FNAME>.HEX

Here, <A> refers to drive on which the source file (.ASM) is resident.
      <B> refers to the residency of the HEX file (.HEX).
      <C> refers to the residency of the list file (.PRN).
      <B> and <C> can be X or Z, where:
          X refers to console screen;
          Z refers to the "bit bucket."
```

Figure 4. These three command lines are employed when you use the CP/M assembler ASM to produce an executable version of SPF.ASM (Listing 4). The executable version (<FNAME>.COM) is generated by LOAD.

```
MAC fname.ASM $Ad Hd Pd Sd
LOAD fname.HEX
ERA fname.HEX

Here, Ad refers to the drive on which the source file (.ASM) is resident.
      Hd refers to the residency of the HEX file (.HEX).
      Pd refers to the residency of the print file (.PRN).
      Sd refers to the residency of the symbol file (.SYM).
Output may be to disk units A: through O:, and to
      P for listings directly to the printer;
      X for listings directly to the console screen;
      Z for output to the "bit bucket" -- thrown away.
```

Figure 5. These command lines are employed when you use the CP/M assembler MAC to produce an executable version of SPF.ASM (Listing 4). The executable version (<FNAME>.COM) is generated by LOAD.

used, and Digital Research's ASM assembler, which is included with CP/M-85. Figure 4 shows the sequence of commands for the ASM assembler, and Figure 5 shows the commands for the MAC assembler.

The SPF utility is called in the same way as in the previous versions; namely, by entering the file name <FNAME>, which loads and executes the <FNAME>.COM file. The operating instructions for this version are the same as well.

In conclusion

That's it. I hope you will find these utilities as useful as I have.

As I mentioned before, the source code is here for you to modify, enhance, etc., to meet your particular needs and printers. In addition to being useful utilities, the source-code listings provide a good comparison of the 8080/8085 and 8086/8088 assembly languages, as well as a good comparison of the Z-DOS/MS-DOS, CP/M-86, and CP/M-85 system function calls.

Good luck.

Additional Information

MS-DOS Version 3 Programmer's Utility Pack, model #CB-3163-30, $225.
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The program was written for HDOS or CP/M. It may give you some hints on adapting it to other printers and operating systems.

Ronald La Claustra

What do you do when your favorite word processor can't put your printer through all its paces?

That was the situation I faced using my Centronics 737 printer with my H89 and the PIE editor and TEXT print formatter from The Software Toolworks. My problem was proportional spacing; since not too many word processing packages support proportional spacing, you may face the same problem.

The Centronics model 737 and 739 printers are versatile machines with fine print quality. (The 737 was also sold as the Atari 825.) The 737 and 739 each originally cost about $1,000. Unfortunately, their maker stopped selling them when they found they couldn't compete with Japanese manufacturers in the low-end segment of the market. Still, for those who were attracted by the machines' features, they haven't been equalled.

In my case, I was particularly impressed with the proportional printing capability of these printers. I liked the style of letters and the "near letter quality" look of the printing.

Proportional spacing

The kind of type seen in most computer printouts comes to us from the world of typewriters and teletypewriters. It's great for catching errors; the horizontal space taken up by letters and the spaces between words are all the same width ("mono-spaced"). As a result, the characters line up vertically in columns. That's convenient for numbers and listings, but not pretty for ordinary English text.

On the other hand, in a book or magazine (such as *Sextant*) that is typeset, the letters you read are not all the same width; *W* is wider than *i*, for instance. The characters are "proportionally" spaced. The shapes go back millenia and have been designed for beauty and for maximum ease of reading.

Technically, proportional printing simply means that different characters will have different widths; their "proportions" will be different. In practice, it means that characters used together in words will flow into each other without one being more conspicuous than another. They will be in "proportion" to each other.

I figured it was about time I got what I paid for out of my printer.

Also, book and magazine printing is usually justified; that is, each line is stuffed with various-sized spaces so that the margins of the text come out even. This is done by means of "incremental" spacing—on some printers, extra spaces as small as the width of one printhead dot can be inserted between words. Mono-spaced printing can also be justified by inserting whole spaces, but the output lacks elegance.

Together, incremental spacing and proportional character widths make for very attractive right-justified copy. The letters themselves "fit together" nicely. And all the spaces between words on a given line will be nearly the same size. There won't be the "gappiness" that can show up when you right-justify mono-spaced text.

The Centronics printer, in addition to having proportional character widths, also supports incremental spacing. As usual in computer land, though, *you* have to supply the software for justifying your text.

Some of the more elaborate word processors can handle both proportional characters and incremental spacing, but TEXT doesn't support either one.

Without incremental spacing, printing with just the 737's proportional characters produces individual words that look good. But the spaces that the Centronics puts between words seem too short; full lines look a bit cramped.

Well, I figured it was about time I got what I paid for out of my printer. I resolved that I would write a program to get the full impact of proportional printing and right justification for those special jobs such as résumés, business letters, and reports.

The task proved difficult to code. (I guess that's why it hadn't been done before; it took me a couple of years to finish.)

I present the end result here, in Listing 1. It's JUSTIFY.BAS, written in Microsoft BASIC.

When I'm running under the Heath Disk Operating System (HDOS), I use the CT.DVD printer driver written for the 737/739 by FBE Research Company of Seattle, Washington. JUSTIFY gives you the choice of working under HDOS with the FBE driver or with some other driver. The same choice that lets you run under HDOS with a non-FBE driver also lets you run under CP/M. (The conversion involves activating five lines that appear as REMarks in the listing, and deleting—or deactivating—three others. See lines 11 and 12.)

As far as I know the only similar thing was an entire editing system someone was selling in *Buss* a few years ago. (In MBASIC!)

The program

I decided the sort of thing I needed was a "post-format processor": a program that would work *after* the text had gone through my usual editor/formatter process. I didn't want to re-invent the

Ronald La Claustra is an electronics technician who lives in Brooklyn, where he pursues his interest in computers by writing occasional freelance articles.

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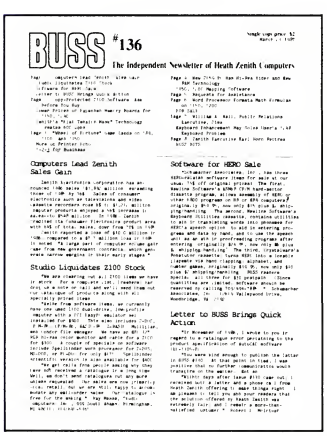
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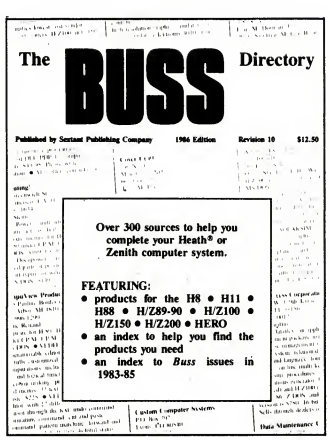

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wheel by writing a specific word processing program for the 737—the program probably wouldn't work that well anyway.

That decision meant that the processor would have to operate with a fixed set of assumptions about what it would be fed, but I didn't see that as a great problem. Moreover, the requirements are simple enough that any word processing software can produce the text that is to be printed proportionally spaced and justified.

Before I save my document, I have the formatter produce an output file with suitable margins for JUSTIFY to produce the desired printing width. (With the 737, the proportional-spaced output averages out to around 12 characters per inch. You'll have to experiment to find the exact number of characters that best corresponds to the desired width on your printer.)

JUSTIFY has a lot of work to do. It first sets up in memory a table of the ASCII printing characters with their corresponding Centronics dot widths. It then scans the input text character by character and compares each to the table to find and tally the dot widths. With this sum, the sum of the spaces in the line, and the calculated maximum dots for the desired line width, the program figures out how wide to make the spaces between words in order to have the line end at the specified right margin.

I will forgo any description of the algorithm beyond that. Sorry, but it would take several tedious pages, and I think it's too specific for general interest. I'll just add the point that the DATA statements (lines 30-70) contain the characters and their widths in printhead "dot values." Also, there are 143 dots per inch, and a full 737 line is 1,185 dots in width. (See line 200.)

As well, I'll try to note those places where you may wish to modify the listing for other printers.

As noted above, JUSTIFY lets you use the HDOS printer driver (CT.DVD) from FBE. The important point here is that the FBE driver expects to receive the codes to control the printer as letters preceded by a tilde (~) character. For instance, ~Q produces "Select Proportional Printing," and ~A gives you "Move Print Head Right 1 Dot Space." (See lines 140 and 170.)

I think that scheme is unique to the FBE device driver. For another device driver or for CP/M, translate the tilde codes in the listing to the appropriate Centronics ESCape sequences. (See lines 171-173.) For other printers, your documentation should indicate which codes are used for which operations and what the character widths are. You may also need to change the dots-per-inch value in line 200.

```
10 'JUSTIFY  / /81  1/14/83  8/17/86  RONALD LACLAUSTRA
11 'FOR USE WITH CP/M, AND/OR NON-FBE HDOS DRIVER, DELETE LINES 110,140,170.
12 '    THEN ACTIVATE LINES 111,141,171-3
20 PRINT CHR$(27)+"E"   'CLEAR SCREEN
30 DATA e,12,t,10,a,12,i,8,n,12,s,12,r,10,o,12,l,8,d,12,h,12,c,10,m,16,u,12
40 DATA f,10,p,12,g,12,.,7,b,12,y,12,w,16,",",7,I,10,S,12,T,14,E,14,P,14,k,12
50 DATA N,16,x,12,',7,O,16,A,16,M,18,C,14,U,16,R,15,D,16,L,14,;,7,F,14,B,15
60 DATA z,10,q,12,G,16,Y,16,H,16,j,6,v,12,?,12,W,18,%,16,K,16,V,16,#,15,Z,10
70 DATA ":",7,(,7,),7,!,7,J,14,&,14,Q,14,X,16
71 'CAN'T TAKE " WHICH IS 10 DOTS
80 CLEAR 500: DIM D$(63),V(63)
90 FOR X=0 TO 63: READ D$(X),V(X): NEXT X
100 INPUT"ENTER INPUT FILE NAME. PROGRAM WILL ADD '.TXT' EXTENSION ";A$
110 INPUT"ENTER 'TT:' , 'LP:' OR OUTPUT FILE NAME. INCLUDE '.LPT' EXTENSION.";B$
111 'INPUT"ENTER OUTPUT FILE NAME. INCLUDE '.LPT' EXTENSION.";B$
120 OPEN "I",#1,A$+".TXT"
130 OPEN "O",#2,B$
140 PRINT #2,"~Q"    'SET PRINTER TO PROPORTIONAL
141 'PRINT #2,CHR$(27)+CHR$(17)
150 'USES A,B,C,D,DS,G,MN,MX,N,NR,O,Q,R,RM,SP,TF,TT,V,W,WS,X,Z
160 C=63:N=12:Q=7:R=56:Z=1:O=0:TF=25:TB$=CHR$(9):NO$="":SP$=" ":
170 AD$="~A":BD$="~B":CD$="~C":DD$="~D":ED$="~E":FD$="~F":BS$=" ~B" 'DOT WIDTHS
171 'AD$=CHR$(27)+CHR$(1):BD$=CHR$(27)+CHR$(2):CD$=CHR$(27)+CHR$(3)
172 'DD$=CHR$(27)+CHR$(4):ED$=CHR$(27)+CHR$(5):FD$=CHR$(27)+CHR$(6)
173 'BS$=CHR$(32)+CHR$(2)
180 INPUT"ENTER OUTPUT LINE LENGTH IN DECIMAL INCHES FROM LEFT EDGE. 8 MAX ";A
190 IF A>8.25 THEN PRINT "TOO LARGE": GOTO 180
200 MXDT=INT(143*A): MNDT=INT(MXDT*.65)'  1070=7.5"  1185=MAX DOT LENGTH
210 '          ^ 143 IS NUMBER OF DOTS PER INCH
220 G=0:DS=0:WSP=0:NRMDR=0::RMDR=0:SPTL=0:TTL=0:W=0:X=0
230 ES$=NO$:C$=NO$:Q$=NO$:S$=NO$
240 LINE INPUT #1,B$
250 IF EOF(1) THEN END
260 W=LEN(B$)
270 IF W=0 THEN Q$=NO$:GOTO 650
280 FOR B=Z TO W
290   C$=MID$(B$,B,Z)
300   IF C$=TB$ THEN TTL=TTL+R: GOTO 400  'TABS=8 SPACES
310   IF C$<>SP$ THEN G=G+Z: GOTO 350
320   IF G<Z THEN TTL=TTL+Q ELSE SPTL=SPTL+Z
330   IF B>TF AND SPTL=0 THEN ES$=BS$: GOTO 570
340   GOTO 400
350   FOR D=0 TO C
360     IF C$<>D$(D) THEN 380
370     TTL=TTL+V(D): GOTO 400
380   NEXT D
390   TTL=TTL+N
400 NEXT B
410 IF TTL<MNDT THEN ES$=BS$:GOTO 570
420 RMDR=MXDT-TTL
430 IF SPTL<Z THEN SPTL=Z
440 DS=INT(RMDR/SPTL)
450 NRMDR=RMDR MOD SPTL
460 IF DS<Z THEN ES$=NO$: GOTO 570
470 IF DS>=Q THEN WSP=INT(DS/Q): DS=DS MOD Q
480 IF DS=0 THEN S$=NO$: GOTO 560
490 ON DS GOTO 500,510,520,530,540,550
500 S$=AD$: GOTO 560
510 S$=BD$: GOTO 560
520 S$=CD$: GOTO 560
530 S$=DD$: GOTO 560
540 S$=ED$: GOTO 560
550 S$=FD$
560 IF WSP=0 THEN ES$=S$ ELSE FOR X=Z TO WSP: ES$=ES$+SP$: NEXT X: ES$=ES$+S$
570 G=0: FOR B=Z TO W
580   C$=MID$(B$,B,Z)
590   IF C$=TB$ THEN 630
600   IF C$<>SP$ THEN G=G+Z: GOTO 630
610   IF G<Z THEN 630 ELSE C$=ES$
620   IF NRMDR<>0 THEN C$=C$+AD$: NRMDR=NRMDR-Z
630   Q$=Q$+C$
640 NEXT B
650 PRINT #2,Q$
660 GOTO 220
670 END
```

Listing 1. JUSTIFY.BAS will right justify a text file for printing on Centronics models 737 and 739. (See text for comments on modifying this listing for use with other printers.) As given here, JUSTIFY is written for MBASIC under HDOS with FBE Research's CT.DVD printer driver. In lines 11 and 12, note the changes that let it run both under the CP/M operating system and under HDOS with a non-FBE driver.

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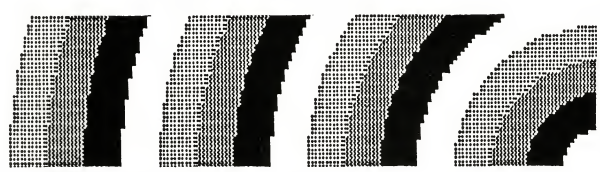

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Using JUSTIFY

To use JUSTIFY on 8½"-wide paper with 6½" of printing, write your text and format it so the result is a disk file that has its left margin 15 character spaces in from the screen/paper edge, and the right margin in the range of 95 to 105.

A left margin is needed because the paper cannot be moved left or right in the Centronics. You don't need to worry about this if the paper can be moved appropriately to the left or right in your printer—as it can in some printers. Just drop the left margin and use a right margin 80 to 90 character spaces over. (No program lines are affected.)

Also, do not have your formatter justify the text: don't let it add spaces to fill out the line. Just let it fill the line with text 'til full. (It's all right for your formatter to drop in the extra space at the end of a sentence.) Then give the output file a .TXT extension.

Those are the only requirements for files to be sent to JUSTIFY. If you wish to print lines that are other than "standard," vary the margins of the formatted file. To get the effect of two columns per page, for example, use a left margin of five spaces in, and end 50 to the right. Tell JUSTIFY to print a 3.9" line. You'll have to cut and paste for the finished product. Experiment with the margins for other sizes or printers.

Unfortunately, MBASIC can't take the quotation mark in a DATA statement; so, for each quote in a line of text, there will be a minor error in the width of that line. Also, tab characters will be calculated as eight spaces, but a real tab will be sent to the printer. (CT.DVD converts tabs to the appropriate number of spaces; tabs may cause problems with other printer drivers.)

Running the program

When you run JUSTIFY, it will prompt you for the width of line you wish. This includes the space used by the left margin, so 7½" is usual. Subtract appropriately if you're shifting the paper to the left. It will also prompt you for drive and file specifications for where the text comes from and goes to. (Don't try to send the output directly to CON: or LST: under CP/M MBASIC. An invalid disk file name will result.)

The program will insert spacing evenly between words in each line, creating straight margins. The output can be sent to a disk file or directly to the printer.

Although built for speed, JUSTIFY is awesome in its slowness with interpreted MBASIC—about 22 minutes per page! So, unless the text is a one-page letter, send the output to another disk file, and go out for lunch. When it's done, you can send the resulting disk file to your printer. (If you want to see how things are going, add 255 PRINT B$ to the program.)

Keep in mind the size of the files in these operations. The output of the formatter may be a few sectors longer than your original file. The output file of JUSTIFY can be prodigious: 50-100% larger.

Listing 2. JUSTIFY.PAS is written for Turbo Pascal version 3.0 running under CP/M. It is considerably faster than the MBASIC version in Listing 1—1.5 minutes per page versus more than 20. Note that this Pascal version requires you to set up a file, JARRAY.TXT, to hold the same character-width information as the DATA statements in lines 30-70 of Listing 1.

```
{PROGRAM JUSTIFY  / /81  CPM 12/30/84 1/13/85 1/24/86 RONALD LACLAUSTRA}
LABEL
500,600;

CONST
NEWSPACE=#32#27#3; NOSTR=''; ONEDOT=#27#1; SETPROP=#27#17; SPSTR=' '; TABSTR=#9;

VAR
B,CODE,D,DS,G,MN,MNDT,MX,MXDT,NR,NRMDR,RM,RMDR,
  SP,SPTL,TTL,W,WS,WSP,X:INTEGER;
A:REAL;
VSTR:STRING[2];
ESSTR,SSTR,FILENAME:STRING[14];
BSTR,CSTR,QSTR:STRING[255];
V:ARRAY[0..64] OF INTEGER;
DSTR:ARRAY[0..64] OF CHAR;
INFILE:TEXT;
OUTFILE:TEXT;
ARRAYFILE:TEXT;

PROCEDURE LOADARRAY;
BEGIN;
ASSIGN (ARRAYFILE,'JARRAY.TXT');
RESET (ARRAYFILE);
FOR X:=0 TO 64 DO
BEGIN;
 READLN(ARRAYFILE, DSTR[X]);
 READLN(ARRAYFILE,VSTR);
 VAL(VSTR,V[X],CODE);
END;
CLOSE(ARRAYFILE);
END;

PROCEDURE SEARCHARRAY;
BEGIN
 D:=-1;
 REPEAT;
  D:=D+1;
 UNTIL (D=65) OR (CSTR=DSTR[D]);
 IF D=65 THEN TTL:=TTL+12 ELSE TTL:=TTL+V[D];
END;


BEGIN {JUSTIFY}
WRITELN (#27+'E');
LOADARRAY;
WRITELN('ENTER INPUT FILE NAME. PROGRAM WILL ADD ".TXT" EXTENSION');
READLN(FILENAME);
ASSIGN(INFILE,FILENAME+'.TXT');
RESET(INFILE);
WRITELN('ENTER "CON:" , "LST:" OR OUTPUT FILE NAME, INCLUDE ".LST" EXTENSION');
READLN(FILENAME);
ASSIGN(OUTFILE,FILENAME);
REWRITE(OUTFILE);
WRITE(OUTFILE,SETPROP);
REPEAT;
 A:=7.5;
 WRITELN('ENTER OUTPUT LINE LENGTH IN DECIMAL INCHES FROM LEFT EDGE OF PAPER');
 WRITE('8.25 MAX (7.5 FOR STANDARD PAPER SIZE)  <7.5> ');
 READ(A);                                                              →
```

Pascal is faster

The Turbo Pascal version of JUSTIFY is much faster. It takes about 1.5 minutes per page. (Shown in Listing 2, it is written for Turbo Pascal version 3.0 running under CP/M.) It works the same way as the BASIC version, with slight differences for the CP/M operating system.

Pascal has no DATA statement to handle the character-width information given in lines 30-70 of Listing 1. Therefore, you must set up a file called JARRAY.TXT and place it on the same disk as JUSTIFY.PAS.

JARRAY.TXT should contain the same list as in the DATA statements of the MBASIC program—only formatted for Turbo, with one item per line and no separators. You can do that with a text-editor program. The Turbo version of the program won't have any problems handling a quotation mark; after the entry for the semicolon, add an entry for the quotation mark with a width of 10.

Those characters not listed are 12 dots wide. You don't need to include them unless you're trying to adapt the program

```
UNTIL A<8.25;
MXDT:=TRUNC(143*A); MNDT:=TRUNC(MXDT*0.65); {  1070=7.5"  1185 =MAX  }
REPEAT;
 DS:=0; G:=0; NRMDR:=0; RMDR:=0; SPTL:=0; TTL:=0; W:=0; WSP:=0; X:=0;
 CSTR:=''; ESSTR:=''; QSTR:=''; SSTR:='';
 READLN(INFILE,BSTR);
 IF EOF(INFILE) THEN GOTO 600;
 W:=LENGTH(BSTR);
 IF W=0 THEN BEGIN; QSTR:=NOSTR; WRITELN(OUTFILE,QSTR); GOTO 600; END;
 FOR B:=1 TO W DO
 BEGIN;
  CSTR:=COPY(BSTR,B,1);
  IF CSTR=TABSTR THEN TTL:=TTL+56 ELSE
    BEGIN;
      IF CSTR<>SPSTR THEN BEGIN G:=G+1; SEARCHARRAY; END
        ELSE BEGIN;
              IF G<1 THEN TTL:=TTL+7 ELSE SPTL:=SPTL+1;
              IF (B>25) AND (SPTL=0) THEN BEGIN; ESSTR:=NEWSPACE; GOTO 500; END;
             END;
    END;
 END;
 IF TTL<MNDT THEN BEGIN; ESSTR:=NEWSPACE; GOTO 500; END;
 RMDR:=MXDT-TTL;
 IF SPTL<1 THEN SPTL:=1;
 DS:=(RMDR DIV SPTL);
 NRMDR:=RMDR MOD SPTL;
 IF DS<1 THEN BEGIN; ESSTR:=NOSTR; GOTO 500; END;
 IF DS>=7 THEN BEGIN; WSP:=(DS DIV 7); DS:=DS MOD 7; END;
 CASE DS OF
  0:SSTR:=NOSTR;
  1:SSTR:=#27#1; {^A}
  2:SSTR:=#27#2; {^B}
  3:SSTR:=#27#3; {^C}
  4:SSTR:=#27#4; {^D}
  5:SSTR:=#27#5; {^E}
  6:SSTR:=#27#6; {^F}
 END;

 IF WSP=0 THEN ESSTR:=SSTR
   ELSE BEGIN;
          FOR X:=1 TO WSP DO ESSTR:=ESSTR+SPSTR; ESSTR:=ESSTR+SSTR;
        END;
  500: G:=0;
  FOR B:=1 TO W DO
  BEGIN;
    CSTR:=COPY(BSTR,B,1);
    IF CSTR<>TABSTR THEN
      BEGIN;
        IF CSTR=SPSTR THEN
          BEGIN;
           IF G>=1 THEN
             BEGIN;
              CSTR:=ESSTR;
             IF NRMDR<>0 THEN BEGIN; CSTR:=CSTR+ONEDOT; NRMDR:=NRMDR-1; END;
             END;
          END
        ELSE G:=G+1;
      END;
   QSTR:=QSTR+CSTR;
   END;
  WRITELN(OUTFILE,QSTR);
 600:UNTIL EOF(INFILE);
 CLOSE(INFILE);
 CLOSE(OUTFILE);
 END.
```

to a printer with differing character-width values.

You'll note the horrible GOTOs in Listing 2. This is one of the cases where their use is truly needed. I could find no way to remove them without making the program less "tidy." Don't be browbeaten by the high priests: sometimes GOTO is the only wayto.

Operation of the Pascal version is the same as described for the BASIC version.

Problems?

The possible pitfalls of using JUSTIFY are due to the "assumptions" it makes as to the nature of the text it's being fed. JUSTIFY has been tuned for standard 8½"-wide paper, with one-inch margins at the left and right.

Other printing widths will require experimentation on your part as to the right margin needed in the input file. JUSTIFY may incorrectly process text within very narrow margins (less than 4" or so): the margins may be exceeded or lines may end up short. In my use, the problem has been rare, but this does vary with the actual text. If you're going to do a lot of narrow printing, you might try reducing the .65 in line 200 of the MBASIC program (or its Pascal equivalent) to .50 or less. (See the discussion of "short lines" below.)

The program also assumes an "average" mix of characters in the text. However, the range of "dot widths" can vary greatly from printing 80 letter *i*'s to 80 letter *W*'s. So, there is a remote possibility that a line of 95 character spaces could be too big for JUSTIFY to hold; the line would push through the right margin. If the input line is too long, JUSTIFY will whittle down the space between words to as little as none.

Varying the input file's right margin of 95 will also vary the inter-word spacing of the justified output. (I find 95 to be the minimum for standard paper that's 8½" after the sprocket-hole strip has been removed; 100 seems to produce fine-looking output with most text.)

A less serious problem is a "short line" that isn't supposed to reach the right margin (such as that at the end of a paragraph). JUSTIFY will fill out any line whose "dot totals" exceed about 65% of a full line. (See line 200.) Again, depending on the text, this could result in a line with rather large inter-word spacing. Fortunately, this doesn't happen often.

In short lines that are *not* justified, the "standard" 737 proportional blank space is replaced by a wider one, to better match the spacing in the rest of the text. (See lines 330 and 410.) The standard 737 space is used for all indentations, however. So, indentations may appear relatively shorter with JUSTIFY than when the text is printed in mono-space. You may wish to compensate for this with your text formatter.

Proportional printing also might mess up any vertical columns and centering in your formatted text file. This is due to the varying width of the letters. (On the 737, all digits are the same width, though.)

JUSTIFY assumes that any input with an indent of more than 25 blank spaces is a heading or footing and will print it as it is (line 330). These indentations might appear at the top and close of a letter, for example. Again, the "standard space" is used; so output of these lines may require compensation. You only have to figure it out once, then use the new indent values the next time you format for JUSTIFY.

By the way, the FBE driver won't print the JUSTIFY.BAS listing correctly; the embedded tildes are interpreted as printer commands and are executed rather than printed.

JUSTIFY has worked well with my texts, and I hope it serves your needs as well.

Additional Information

CT.DVD printer driver, $14.95; driver and H89PIP parallel interface card, $50; printer cable, $24.
FBE Research Company, Inc.
P.O. Box 68234
Seattle, WA 98168
206/246-9815 Δ

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Zenith Data Systems (ZDS) introduced in February the Z159 computer. Based on the 8088 microprocessor, the '159 is the newest version in the Z150 series of IBM-compatible computers.

Like the '158—the machine it replaces—the '159's operating speed is switchable between 8 and 4.77 megahertz. The '159, though, is designed to have a somewhat higher degree of IBM compatibility than the '158. In that regard it resembles the '151, while also offering the latest video and memory technology.

Either EGA or CGA

The '159 is available with either an enhanced graphics adapter (EGA) or Hercules-compatible video card. The EGA card allows for high-resolution color display when used with an EGA-compatible monitor. The Hercules-compatible video card allows for high-resolution monochrome display, and is CGA-compatible for standard color displays.

More RAM

The system also offers a random-access memory (RAM) card that accepts Expanded Memory Specification (EMS) upgrade chips. The card permits up to 1.25 megabytes of addressable RAM without using an expansion slot. Adding three additional EMS memory cards allows you to go up to 5 megabytes.

EMS technology breaks previous limits on the amount of addressable RAM that software can access. Sponsored by Lotus Development Corporation, Microsoft Corporation, and Intel Corporation, EMS allows for more intensive spreadsheet, data base and window software applications.

By surpassing the 640K threshold, EMS technology is expected to spur development of a more powerful generation of software.

More speed

Because of these enhancements to video performance and memory, ZDS President Robert Dilworth says that he anticipates the '159 will "breathe new life into the market for 8088-based personal computers."

The '159 also features zero wait state technology to take full advantage of the high speed of the Intel 8088 processor. It comes standard with 256K of RAM, serial and parallel ports, and MS-DOS version 3.2.

The recently announced Z159 is switchable between 4.77 and 8 megahertz. The '158 offered the same option, but was somewhat less IBM-compatible than the '159. The newer machine takes advantage of the latest in EMS technology, accepting up to 1.25 megabytes of addressable RAM without using an expansion slot. Video performance of the '159 is also improved.

A number of choices

Five '159 models are available. Model 1 offers a single 5¼" floppy-disk drive, Hercules-compatible/CGA video card, and five open expansion slots, for $1,749.

Model 2 offers two 5¼" floppy-disk drives, Hercules-compatible/CGA video card, and five open expansion slots, for $1,899.

Model 3 offers a 20-megabyte hard-disk drive, one 5¼" floppy-disk drive, Hercules-compatible/CGA video card, and four open expansion slots, for $2,499.

Model 12 includes two 5¼" floppy-disk drives, EGA video card, and four open expansion slots, and is priced at $2,199.

Model 13 offers a 20-megabyte hard-disk drive, one 5¼" floppy-disk drive, EGA video card, three open expansion slots, and Microsoft Windows, for $2,799.

The basic '159 weighs 42 pounds, and its dimensions are 16"W x 6.25"H x 16.5"D.

ZDS will market the '159 through a national account program and its U.S. dealer network, including the Heath/Zenith Computers and Electronics centers.

For more information on the '159, contact Zenith Data Systems, 1000 Milwaukee Avenue, Glenview, IL 60025, 800/842-9000.

World Data Bank Map Data Base Debuts for Personal Computers

Microcomputer owners can now own the world—the World Data Bank II, a 178,000-point map data base providing coverage for coastlines, country and state boundaries, islands, rivers, and lakes, in five levels of detail.

The data base has been extracted and compressed from files used by the National Technical Information Service (NTIS), which has granted permission for it to be placed in the public domain in standard MS-DOS 5¼" floppy-disk format. The Micro WDB II takes a little over one megabyte of disk storage.

The distribution disks contain documentation describing the files and the two programs, which run on the Z100 and Z150, as well as on CGA- and EGA-based systems such as the new Z159. Several basic utilities are provided to assist in customizing the files and, along with the two main display programs, come with the Pascal source code.

Micro WDB II, which costs $10 to defray shipping and handling costs, consists of five disks. Upon receipt, the data base and programs may be copied and placed in club libraries, etc., but may not be resold. Order from Micro Doc, 3108 Jackson Street, Bellevue, NE 68005. For more information, call Fred Pospeschil, 402/291-0795 (7 to 10 p.m. Central Time).

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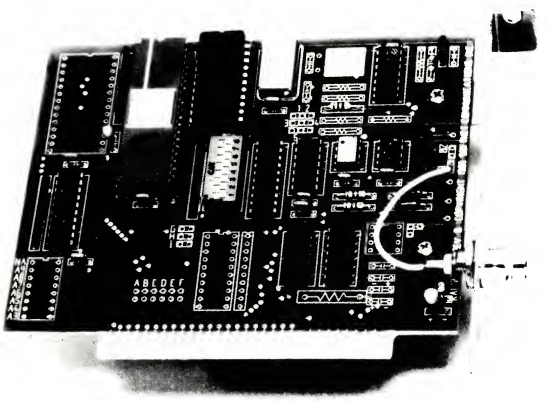

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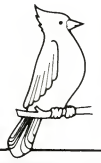

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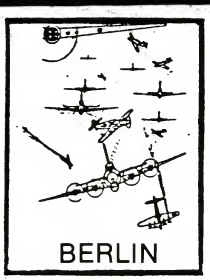

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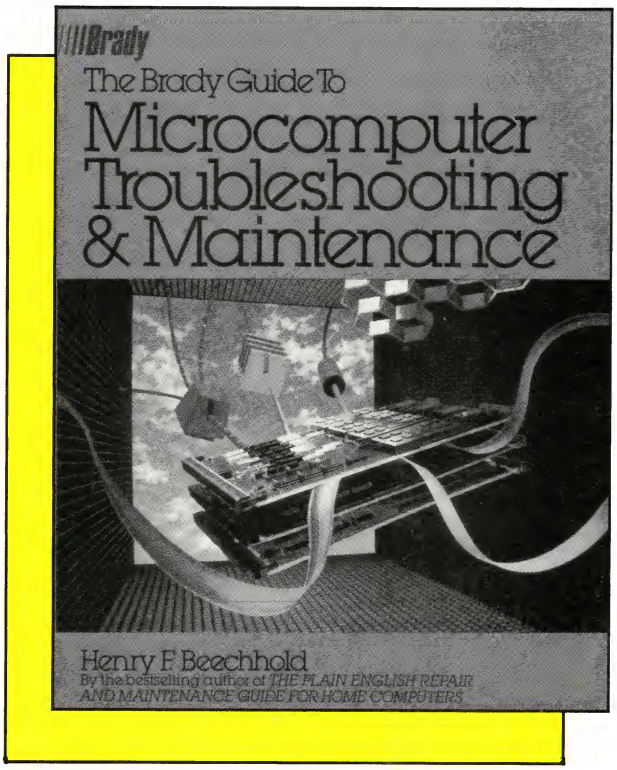

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